SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

[*The* MINING JOURNAL *is Registered at the General Post Office as a Newspaper, and for Transmission Abroad.*]

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BY POST £1 4s. PER ANNUM.

BELL'S ASBESTOS.

BELL'S PATENT ASBESTOS BLOCK PACKING for High-Pressure Engines

The following testimonials refer to this Packing:—

Mona Lodge, Amlwich, Anglesey,
2nd August, 1884.

Dear Sir,—I have much pleasure in answering your note. Bad times in mining have compelled me to try all kinds of expedients in order to effect saving; some have succeeded and some have failed, but my underground manager, Capt. Hughes, has just said to me by the telephone—"The Asbestos Packing is the best thing ever brought here."

It saves money and trouble, but like my gas purifying oxide it lasts so long that you must not expect another order from me for twelve months at least.

Yours truly,
T. F. EVANS,
Late H.M. Inspector of Metalliferous Mines.

Mr. J. Bell.

Manchester, Sheffield, and Lincolnshire Railway—Steamship Department,
Grimsby, April 10th, 1884.

Dear Sir,—I have much pleasure in stating that after a trial of over nine months, and comparing it with other packings, I can confidently recommend your Asbestos Packing. It is especially valuable when high-pressures are employed, as in cases where other packings have perished, owing to high temperatures, your packing has invariably stood well. I have also used it with complete success when a gland has heated with other packings, and also in cases of badly scored piston rods. I consider the results I have obtained by its use for our marine engines to have been in every way highly satisfactory.

Yours truly,
G. H. CLARKE, Sup. Engineer.

Mr. J. Bell.

Department of the Director of Navy Contracts,
Admiralty, Whitehall, 20th June, 1884.

Sir,—I have to inform you that your tender has been accepted for Bell's Rolled Cloth Asbestos Packing to sample submitted:—Elastic core ... ... Square.
" " ... ... Round.

To Mr. John Bell.
JOHN COLLETT, Director of Navy Contracts.

The Patent Block Packing is square, as Fig. 1 and Figs. 2 and 3 represent the Round Block Packing with solid and hollow rubber core, and Fig. 4 without core, but with rubber inlaid. As these packings are extensively imitated, and as it is a common practice among dealers and agents to supply the cheaper manufactures at my list prices, users are requested to see that the packing supplied to them bears the trade mark.

BELL'S ASBESTOS BOILER PRESERVATIVE.—This useful mixture by absorbing the free oxygen that is in the water entirely checks pitting and corrosion. It also disintegrates incrustation so immediately as to prevent its adhering to the plates. Not only is a great economy of fuel effected by keeping boilers clean, but the risk of having the plates burned is thereby obviated. It has been computed that 1/16 in. thick of incrustation causes a waste of 15 per cent. of coal; 1/4 in., 60 per cent.; 1/2 in., 150 per cent. Thus the Preservative avoids the great risks which are inseparable from scaled plates, lengthens the life of a boiler, and covers its own cost a hundredfold by economy of fuel. It is entirely harmless, and has no injurious action on metals. It can be put into the feed tank or boiler, as may be most convenient. Sold in drums and casks bearing the Trade Mark, without which none is genuine.

BELL'S ASBESTOS YARN and SOAPSTONE PACKING for Locomotives and all Stationary Engines running at very high speed with intense friction.

Sandwell Park Colliery, Smethwick, 1st February, 1884.

To Bell's Asbestos Works.

Dear Sirs,—I have much pleasure in stating that I have used your Asbestos Packing for the last 13 months for our large winding engines which are running night and day, and also for the fan, pumping, and hauling engines at the above Colliery, and during that period we have not used more than one-third the Packing we had formerly; and this I attribute to your Packing on account of its great durability and general excellence of quality.—I am, dear Sirs, yours faithfully,
THOMAS WINTER, Colliery Engineer.

TRADE MARK.

BELL'S ASBESTOS.

The goods of this house are of the highest quality only, and no attempt is made to compete with other manufacturers by the supply of inferior materials at low prices. All "home" orders should be sent direct to the undermentioned depôts and not through Agents or Factors.

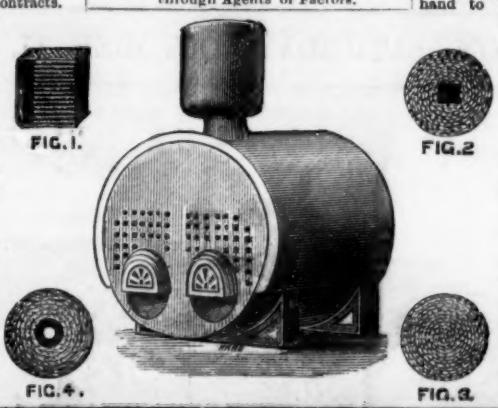


FIG. 1. FIG. 2 FIG. 4. FIG. 3

BELL'S ASBESTOS BOILER AND PIPE COVERING COMPOSITION, for coating every class of steam pipes and boilers, non-combustible and easily applied when steam is up; adheres to metals and preserves them from rust; prevents the unequal expansion and contraction of boilers exposed to weather; covers 50 per cent. more surface than any other coating, and is absolutely indestructible. It can be stripped off after many years' use, mixed up with 25 per cent. of fresh, and applied again. The composition is supplied dry, and is only to be mixed with water to the consistency required for use.

A Horizontal Boiler, 17 ft. 6 in. long, 15-H.P., gave the following results:—
Temperature on Plates - - - 186 deg.
" " Covering - - 94 deg.

One ton of coal was saved per week, and although the fire was raked out every evening 20 lbs. of steam were found in the boiler next morning.

The following Testimonials refers to this Covering:—

Offices of the Wimbledon Local Board, Wimbledon, Nov. 28th, 1883.

Dear Sir,—It may interest you to know that we save exactly 48 per cent. in fuel through using your covering.

Yours truly,
W. SANTO CRIMP, C.E., F.G.S.

The Tamar and Kit Hill Granite Company (Limited),

Mr. John Bell, Southwark, S.E.

Gunnislake, Tavistock, 8th April, 1884.

Sir,—I have much pleasure in stating that the Asbestos covering applied by you to the boiler of our travelling crane at Kit Hill has yielded most remarkable results. Since it has been in use we have saved fully half our coals, and have effected a great saving in the time it takes to get up steam, which is often a matter of great importance to us. I should add that the crane runs on high gantries, and is fully exposed to all weather. I have formed the highest opinion of your Asbestos as used for this purpose, and as you are aware, have had another boiler similarly covered, though it has not since been used. I can most strongly recommend the material.

I am, Sir, yours faithfully,
W. J. CHALK, Assoc. M. Inst. C.E., Engineer and Manager.

BELL'S ASBESTOS and INDIA-RUBBER WOVEN TAPE and SHEETING, for making every class of Steam and Water Joints. It can be bent by hand to the form required without puckering, and is especially useful in making joints of manhole and mudhole doors. It is kept in stock in rolls of 100 ft., from 1/2 in. to 3 in. wide, and any thickness from 1/16 in. upwards. Manhole covers can be lifted many times before the renewal of the jointing material is necessary. The same material is made up into sheets about 40 in. square, and each sheet bears the Trade Mark, without which none is genuine. It is very necessary to guard against imitations of this useful material, and to secure themselves against being supplied with these inferior articles at my price, users are recommended to see that every 10 ft. length of the Asbestos Tape purchased by them bears the Trade Mark.

BELL'S SPECIAL LONDON-MADE ASBESTOS MILLBOARD, for Dry Steam Joints, made of the best Asbestos fibre, is well-known for its toughness and purity, and is absolutely free from the injurious ingredients frequently used to attain an appearance of finish, regardless of the real utility of the material. Made in sheets measuring about 40 in. square, from 1-64th in. to 1 in., and 1/2 millimetre to 25 millimetres thick. Each sheet bears the Trade Mark.

The following copy of acceptance of tender refers to above:—

Department of the Director of Navy Contracts,
Admiralty, Whitehall, S.W., 17th May, 1884.

Sir,—I have to inform you that your tender for Asbestos Millboard has been accepted.—Mr. John Bell.
JOHN COLLETT, Director of Navy Contracts.

BELL'S ASBESTOS EXPANSION SHEETING (PATENT). This Sheeting is another combination of Asbestos with India-rubber, giving to the steam user the special advantages of both materials. The India-rubber Washer is protected from the action of heat and grease by an outer coating of vulcanised Asbestos Cloth, thus producing an excellent joint where expansion and contraction render other materials unserviceable. This material is admirably suited to steam pipe joints and every class of valve. Valves made of this material are very durable, as they are not subject to injury by oil.

BELL'S "ASBESTOS LUBRICANT."

"REGD

ILLUSTRATED PRICED CATALOGUE FREE ON APPLICATION TO

BELL'S ASBESTOS WORKS, SOUTHWARK, LONDON, S.E.

OR THE DEPOTS—118a, SOUTHWARK STREET, S.E.,

Victoria Buildings, Deansgate, MANCHESTER. 11 and 13, St. Vincent Place, GLASGOW. 39, Mount Stuart Square, CARDIFF. 21, Ritter Strasse, BERLIN.

R. S. NEWALL AND CO.,

Sole Patentees of Untwisted Wire Rope.

Iron & Steel Ropes of the highest quality for Collieries, Railways, Suspension Bridges, &c.

PATENT STEEL FLEXIBLE ROPES AND HAWSERS.

IRON STEEL, AND COPPER CORDS. LIGHTNING CONDUCTORS.

COPPER CABLES of high Conductivity for Electric Light and Power.

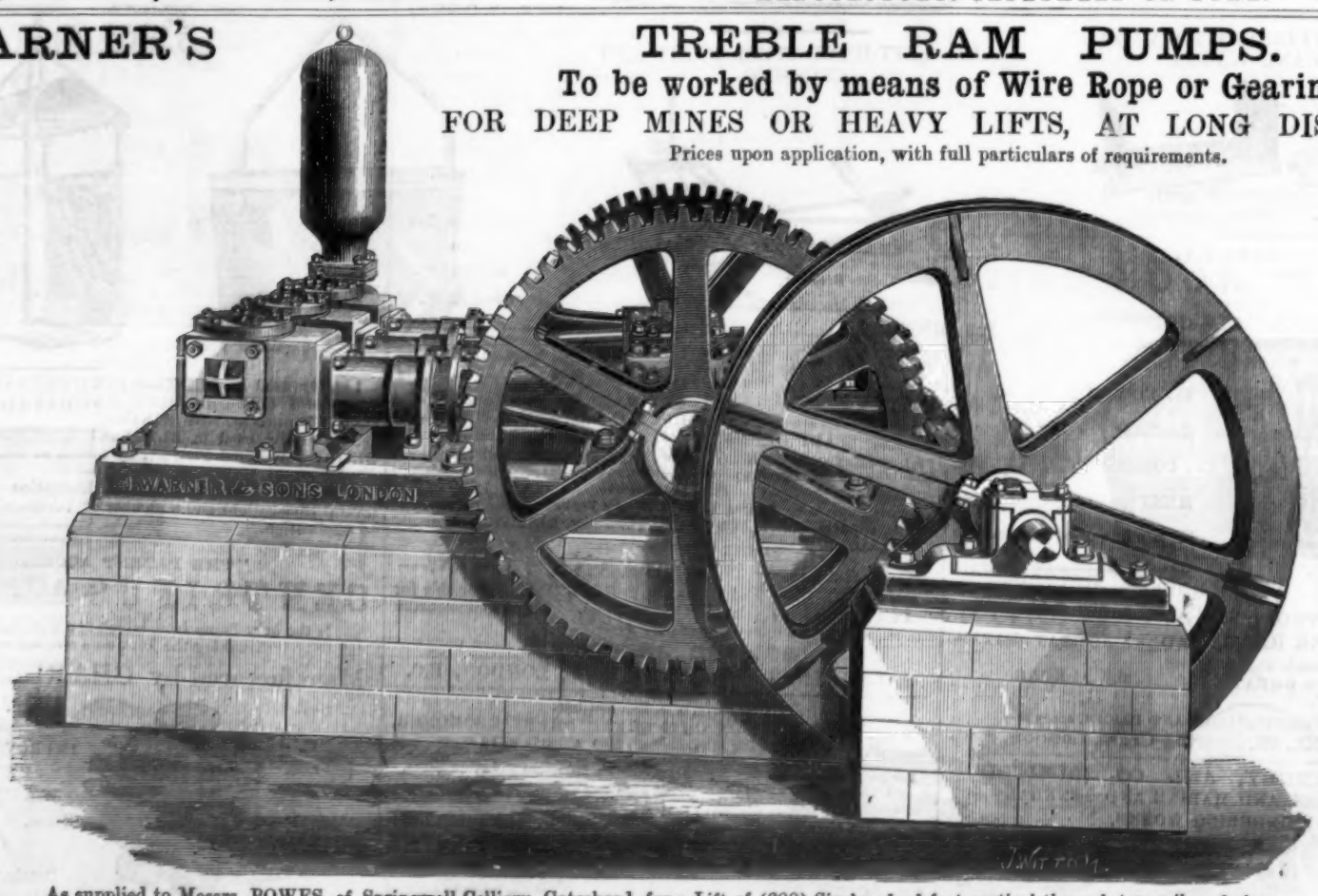
London: 130, STRAND, W.C. Liverpool: 7, NEW QUAY.
Glasgow: 68, ANDERSTON QUAY.
MANUFACTORY: GATESHEAD-ON-TYNE.

WARNER'S TREBLE RAM PUMPS.

To be worked by means of Wire Rope or Gearing.

FOR DEEP MINES OR HEAVY LIFTS, AT LONG DISTANCES.

Prices upon application, with full particulars of requirements.



As supplied to Messrs BOWES, of Springwell Colliery, Gateshead, for a Lift of (600) Six hundred feet vertical through two miles of pipes.

JOHN WARNER AND SONS, THE CRESCENT FOUNDRY, CRIPPLEGATE, LONDON, E.C.

R. HUDSON'S

Patent Steel Trucks, Points and Crossings,

PORTABLE RAILWAY, STEEL BUCKETS, &c., &c.

Telephone No. 14.
In connection with the Leeds Exchange, and all the principal Hotels and places of business in the town.

GILDERSOME FOUNDRY, NEAR LEEDS.

(Near Gildersome Station, G.N.R. Main Line, Bradford to Wakefield and London, via Laisterdyke and Ardsley Junctions.)

Registered Telegraphic Address:—"GILDERSOME, LEEDS." A. B. C. Code used.

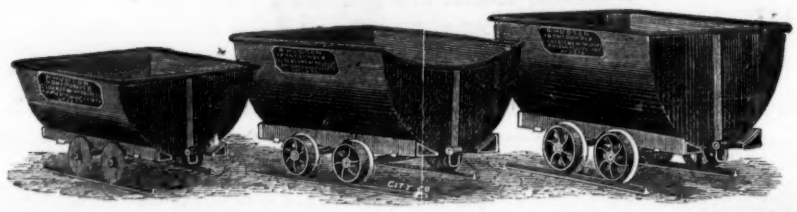
UPWARDS of 25,000 of these Trucks and Wagons have been supplied to the South African Diamond Mines; American, Spanish, Indian, and Welsh Gold, Silver, Copper, and Lead Mines; Indian and Brazilian Railways, and to Railway Contractors, Chemical Works, Brick Works, and Coal and Mineral Shippers, &c., &c., and can be made to lift off the underwork, to let down into the hold of a vessel, and easily replaced. They are also largely used in the Coal and other Mines in this country, and are the LIGHTEST, STRONGEST, and most CAPACIOUS made, infinitely stronger and lighter than wooden ones, and are all fitted with R. H.'s Patent "Rim" round top of wagons, requiring no rivets, and giving immense strength and rigidity. End and body plates are also joined on R. H.'s patent method, dispensing with angle-irons or corner plates.

Patented in Europe, America, Australia, India, and British South Africa, 1875, 1877, 1878, 1881, and 1883.
N.B.—The American, Australian, Indian, and Spanish Patents on Sale.

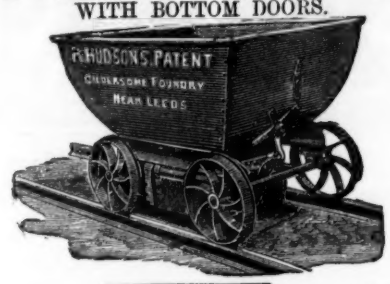
CAN BE MADE TO ANY SIZE, AND TO ANY GAUGE OF RAILS.

1.—PATENT STEEL END TIP WAGONS.

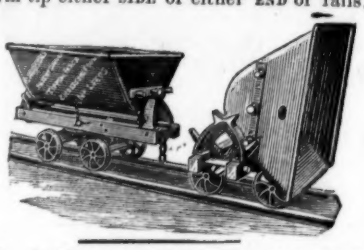
7.—PATENT STEEL MINING WAGONS.



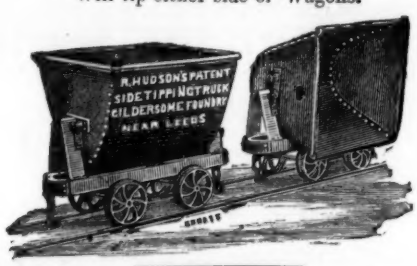
12.—PATENT STEEL HOPPER WAGON, WITH BOTTOM DOORS.



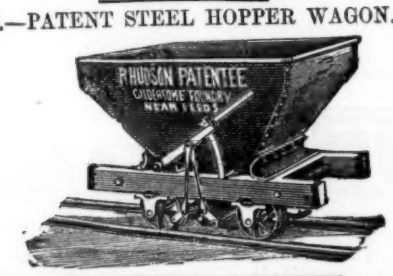
2. PATENT UNIVERSAL TRIPLE-CENTRE STEEL TIPPING TRUCK,
Will tip either SIDE or either END of rails.



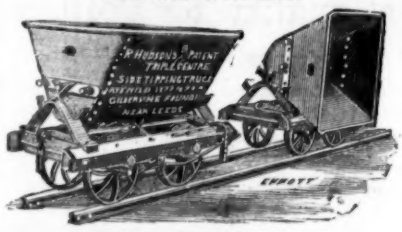
8.- PATENT DOUBLE-CENTRE STEEL SIDE TIP WAGONS,
Will tip either side of Wagons.



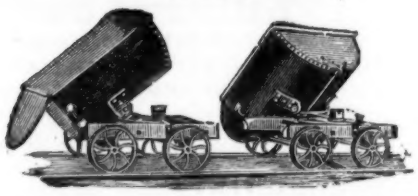
13.—PATENT STEEL HOPPER WAGON.



3.—PATENT TRIPLE-CENTRE STEEL SIDE TIP WAGONS.

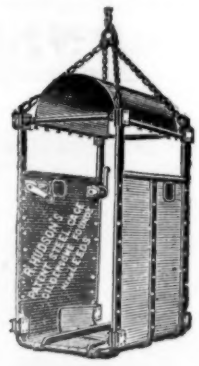


9.—PATENT STEEL ALL-ROUND TIP WAGON.

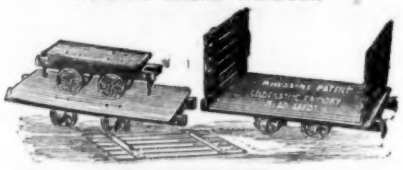


14.—SELF-RIGHTING STEEL TIP BUCKET.
(The "CATCH" can also be made SELF ACTING if desired.)

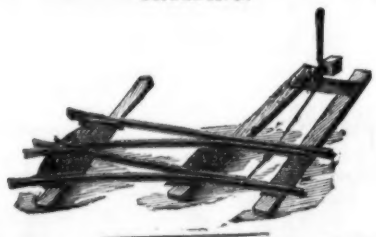
15.—STEEL CAGE.



4. PATENT STEEL PLATFORM OR SUGAR CANE WAGON.

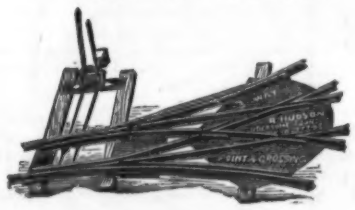


10.—LEFT-HAND STEEL POINT AND CROSSING.

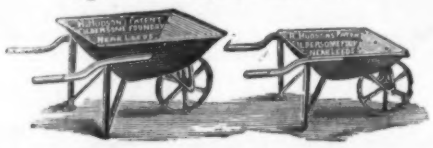


5.—PATENT STEEL CASK.
As supplied to H.M. War Office for the late war in Egypt).
DOUBLE the STRENGTH of ordinary Casks without any INCREASE in weight.
(Made from 10 gals. capacity UPWARDS to any desired size.)

11.—RIGHT AND LEFT-HAND STEEL POINT AND CROSSING.

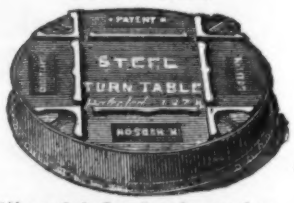


16.—PATENT STEEL WHEELBARROWS.
Made to any Size.
Lightest and Strongest in the Market.



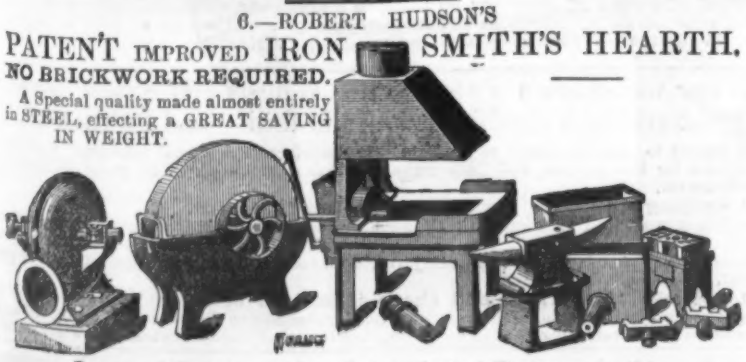
A great success.

17.—STEEL SELF-CONTAINED TURNTABLE.



(Also made in CAST IRON for use where weight is not a consideration.

6.—ROBERT HUDSON'S PATENT IMPROVED IRON SMITH'S HEARTH.
NO BRICKWORK REQUIRED.
A Special quality made almost entirely in STEEL, effecting a GREAT SAVING IN WEIGHT.



Large numbers in use by all the principal Engineers in this country and abroad.

18.—"AERIAL" STEEL WINDING TUB.

Largely employed in the South African Diamond Fields.

No. 19.—PATENT STEEL CHARGING BARROW,
DOUBLE the STRENGTH & much LIGHTER than ordinary Barrows

ALL KINDS OF BOLTS NUTS, AND RIVETS MADE TO ORDER ON THE PREMISES

Hadfield's Sheet of Drawings. List No. 28.

HADFIELD'S STEEL FOUNDRY COMPANY,

ATTERCLIFFE, SHEFFIELD.

GOLD MEDAL.

GOLD MEDAL.

OUR SOLE SPECIALITY IS

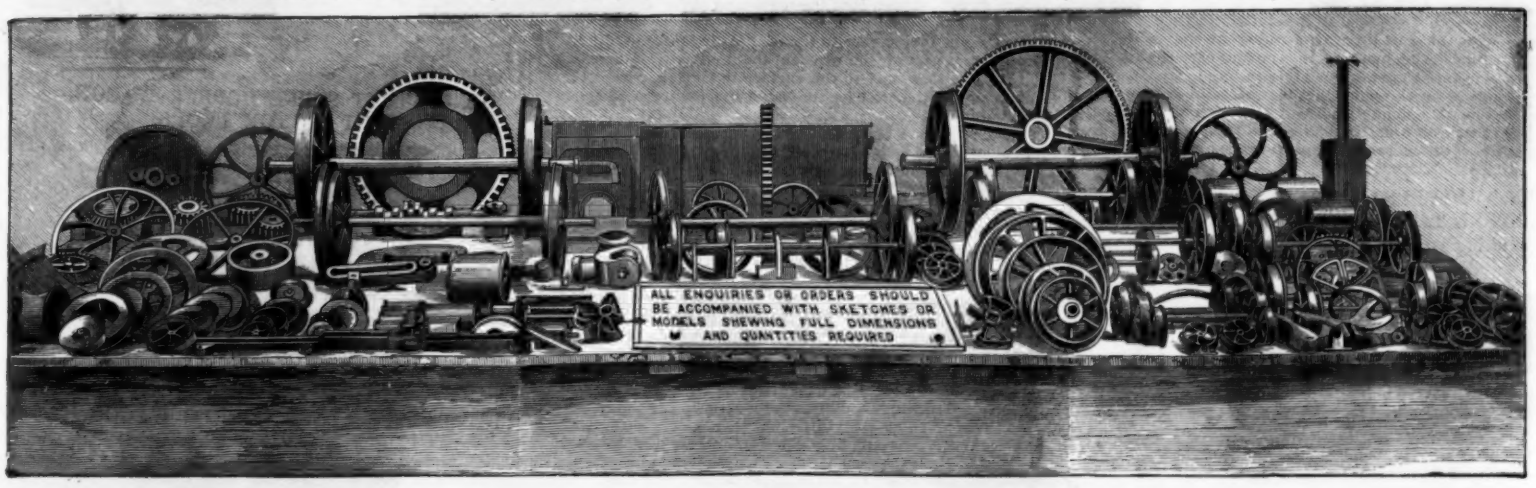
TRADE MARK. **STEEL CASTINGS.** TRADE MARK.

FROM 4 LBS. TO 16.000 LBS. EACH.

Contractors to H. M. Home, India, and Colonial Governments; Home, Foreign, and Colonial Railways, Admiralty, War Departments, &c.

Gold Medal, Paris, 1878.
Gold Medal, Madrid, 1883.
Gold Medal, Melbourne, 1881
Special Diploma of Honour and Silver Medal, Sydney, 1880.

HIGHEST AWARDS, LEEDS, MANCHESTER, WREXHAM, CORNWALL, &c.



HADFIELD'S CAST STEEL WHEELS.

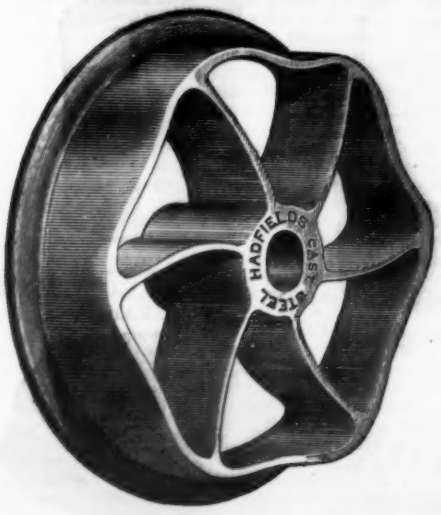
One of our departments is specially adapted for the production of our Patent Steel Wheels and Axles for collieries, tramways, ironstone mines, slate quarries, ironworks, lead mines, &c., and we are now manufacturing **2000** per week. Owing to our patent system of fitting-up Wheels and Axles, which is simple but effective, we are enabled to execute orders with promptitude. We undertake to supply all work entrusted to us in a first-class manner, and only manufacture the BEST quality of material. OVER 1600 DIFFERENT WHEEL, PULLEY, AND PEDESTAL PATTERNS IN STOCK, of varying widths of tread, flanges, &c., any of which can be ready for use at the shortest notice.

In addition to the now universally admitted superiority of Hadfield's steel wheels over those of cast-iron for lightness, strength, and wearing qualities, we claim the following SPECIALITIES for our material over any other steel, malleable iron, or other wheels, viz.:—

Extra TOUGHNESS or TENACITY, DURABILITY, and SOLIDITY; for proof of this kindly read the undermentioned.

X

TOUGHNESS

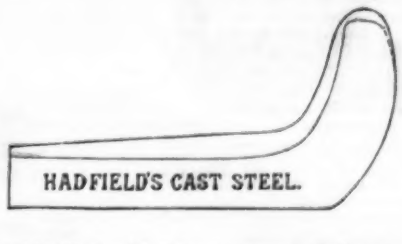


Special attention is drawn to the slight indendations produced by the numerous and heavy blows, thus bearing out our claims for producing a special tough and tenacious steel which will not break or bend easily out of shape, and thus withstand the rough usage experienced at collieries, &c.

X This view represents one of Hadfield's Steel Wheels taken out of stock, bedded upon an anvil (thus getting full force of blow), then hammered COLD with no less than 45 swinging blows of a 14 lb. steel sledge hammer. We undertake that this same wheel, which may be seen at our works, can be heated in a smith's fire, straightened and put to use again; or if desired, a piece therefrom drawn out into a chisel, knife, &c.

This only represents an ordinary specimen of our manufacture.

DURABILITY



Section taken from a wheel kindly furnished by a customer who has many thousands at work. This wheel has run **40,000** miles, carried nearly **10,000** tons of coal, and although at work almost night and day for over five years is only worn so slightly, as shown above—**one-eighth of an inch!!** The wheels in question were 9 inches diameter, and weighed only **14 lbs.** each when put to work. This is only one out of many similar examples of the extraordinary durability of our material.

Prices **per set** furnished on receipt of sizes, either for wheels only or fitted together with Steel Axles by our well-known patent **fast** method. *When so fitted by us we undertake that our wheels shall remain* **fast** *as long as the wheels and axles last.* Upwards of *half-a-million* are now in daily use fitted by Hadfield's patent fast method. This is the only system that successfully withstands the great strains experienced in collieries, &c., without working loose.

NOTE.—Beware of spurious and cheap imitations which eventually work loose, causing great loss and annoyance, as well as bringing discredit on the name of Steel Wheels and Axles. We are constantly replacing such. See, therefore, that Hadfield's name is on every wheel.

We also solicit attention to the following articles, which, in addition to our well-known Patent Steel Wheels and Axles, we are now largely supplying in our CAST STEEL, on account of their great strength combined with durability and lightness.

Rollers, Pulleys, Frames, and Stands.—See our lists of over 240 different patterns. They possess great durability, lightness, and strength, and add considerably to the life of the steel or other ropes.

Self-oiling Wheels (Patent).—Many thousands now at work. Save at least 50 per cent. of oil or grease. Easily charged or refilled. Reduce friction and wear and tear to a minimum.

Pedestals, Bushes, Cage Guides, Buffer Boxes, **Points, Crossings,** and other Colliery Castings of every description.

Over 1700 different patterns of above in stock, ready for use on the shortest notice. New patterns made to suit special requirements free of charge for quantities.

Steel Axles to suit all classes of haulage. We manufacture a special mild quality of steel suitable for this purpose, and have many *hundreds of thousands* in daily use giving every satisfaction.

Steel Gearing of all kinds. Machine moulded or from full patterns.

Miscellaneous Steel Castings, up to 16,000 lbs. each, to replace expensive wrought-iron and steel forgings and heavy iron castings. Tensile strain of our castings 35 to 65 tons per square inch (as tested by Government) varying according to purpose required, with 20 per cent. elongation.

Note.—Beware of spurious and cheap imitations which eventually work loose, causing great loss and annoyance, as well as bringing discredit on the name of Steel Wheels and Axles. We are constantly replacing such. See, therefore, that Hadfield's name is on every wheel.

N.B.—Note the Address, and prove truth of the above by giving our Steel Wheels, &c., a trial.

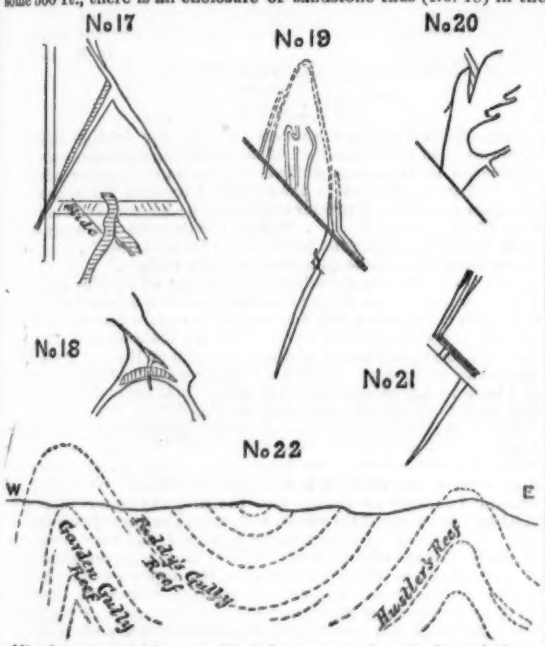
HADFIELD'S STEEL FOUNDRY COMPANY, HECLA WORKS, ATTERCLIFFE, SHEFFIELD.

Original Correspondence.

THE GOLDEN QUARTZ REEFS OF AUSTRALIA.—No. V

SIR,—Reefs.—The next mine north of the Garden Gully United Company is the Victory and Pandora, the main shaft in which is the next the deepest on Bendigo; but before crossing the boundary line between these two mines I will give one more section in the Garden Gully Company, and this with a special view to the illustration of the contortion of a bed of slate under a ∧ saddle reef and its likeness in form to the reef depicted in section No. 16. In this section, No. 17, as usual I have shown the slate in horizontal lines leaving the quartz as a white space between the walls of the reef. Under the "slate" reef, as I take the liberty of calling it, will be observed an incipient quartz reef, the continuation of which upwards passes through the slate reef. On the back of this slate reef is hard sandstone, which forms the usual hanging-wall rock of quartz reefs. Now, with regard to "incipient" reefs, as I call them, these may be looked on from different points of view in the line of strike of reefs. For example, at the southern end of the Garden Gully Reef (see section No. 5) the reef is a mere shadow; on being followed north it increases (see section No. 6) considerably in size. Suppose, on the contrary, we began mining at No. 6 section and worked south to No. 5 then miners would tell us the reef was dying out or tailing out. Such extremities of reefs as that last mentioned I look upon as points where the reefs are growing and extending themselves longitudinally, and, therefore, I prefer the term "tailing out" to "dying out."

At the southern end of the Victory and Pandora Company's Mine is found the southern extremity of the lava streak or dyke, and here very appropriately we may say the dyke dies out. In the south shaft at 390 ft. in depth there is a small saddle reef with a horse of slate enveloped in or near to its centre, whilst in the large saddle reef at 630 ft. in depth the quartz in the top and eastern side (hanging-wall) breaks up into tongues or wedges tailing out in sandstone The lava dyke cuts clean through the solid quartz in a very regular manner; further north a short distance a thin bed of slate passes into the saddle of quartz from the hanging-wall. Still further north, some 500 ft., there is an enclosure of sandstone thus (No. 18) in the



saddle of quartz which, as well as the quartz, is cut through by a lava dyke. In the mine last mentioned a cross vein connects the eastern and western legs beneath the saddle, and from it branch off—parallel with the strike of the main reef—veins running to the north. This is an unusual circumstance; but this mine is in the "crown" formation of the reefs, from whence the saddles of the reefs dip south and dip north, and something out of the common might reasonably be looked for within its area, and so we find a cross vein and the dying out of the lava dyke. In the next mine north of the Unity—in which No. 18 section is taken—the most noticeable fact is the faulting or severance of the saddle or top part of the reef from its leg. But this phenomena is still better illustrated at about 1000 ft. further north in the Kent claim (owned by Mr. J. B. Watson, another pioneer quartz miner and one of the wealthiest on Bendigo). In this section (No. 19) the saddle is of a distorted form; on its western side is a branch stream from the main lava dyke, which runs along the slide or line of fault. Beneath this main lava and some 50 ft. from the lowest extremity of the quartz saddle lies the western leg underlying to the west. This leg is slightly faulted and crossed by another branch lava stream. Above the main lava dyke and over the top of the west leg occur two veins of quartz which I have connected by dotted lines with other two quartz veins which lie to the west of the main body of quartz or saddle. There is sufficient reason for so connecting them and indicating that they belong to a small saddle above, and are in no way to be mixed up with the main body and its western leg. It might be concluded that the most eastern vein is the east leg, belonging to the western, shown in the section, but I do not think this can be the case. The fault here shown amounts to some 50 ft., and its direction upwards (I presume) must have been about an angle of 65°. Had the veins just overlying the top of the western leg been the eastern leg of this formation, why is it 50 ft. away from its saddle and not attached to it, seeing that it is above the line of fault? The eastern leg might never have existed excepting as a mere "track" and this condition might have been due as I have previously indicated (prior to section No. 3) to the simultaneous progression of faulting and reef construction, the motion of faulting being along the line of the eastern leg, and antagonistic to more than the formation of a track containing only thinly laminated and striated quartz plates. The eastern ground opposite this western leg should be tested by crosscuts, and no doubt will be, and these points placed beyond doubt. Certainly the prospect warrants the expenditure. But there is another interesting subject in this section which I must direct attention to, and that is the enclosure of what is usually termed a horse of sandstone in the distorted saddle. This body of sandstone is about 40 ft. in height and 3 ft. in thickness enveloped in quartz, its length I shall refer to presently. At 50 ft. to the south of this section in this reef the formation is like section No. 20, where the fault and other circumstances are quite similar in every respect to that shown in section No. 19, excepting in so far as the sandstone enclosure is concerned. In section 20 the only evidence of the horse is in the wedge, at the top of the quartz, marked by vertical lines. At 600 ft. further north of the section No. 19 the enclosure of sandstone is quite perfect, but the form of the horse is different; for instance, it is nearly 30 ft. in height and 8 ft. in width. Such large envelopments of sandstone as this—over 600 ft. in length, from 30 to 40 ft. in height, and from 3 to 8 ft. in thickness entirely surrounded by solid quartz—form subjects of importance for elucidation in the study of vein formation. Because of its immense size, however, it deserves no more attention from those persons disposed to theorise on this subject than does the microscopic flake of slate enclosed in solid quartz, examples of which can be got in the "mullock" or waste heaps about shafts at Bendigo, &c., by the ton. Their histories must be identical and their existence be due to the same cause. Whatever theory will account for the one must equally apply to the other. My own ideas on this subject have already been published in the *Mining Journal*. I think the slates and sandstones have been changed into quartz, and that these immense horses and minute scales of sandstone and of slate enveloped by solid quartz are merely those portions that have resisted the transformation longest, under more or less unfavourable circumstances to the change. However, it is not my present object to theorise but rather to supply as many accurate facts about quartz reefs as may enable others to theorise and use these facts for their own practical service in vein mining. Your readers' experiences, Mr. Editor, will be different to our Australian, and I hope some one or more of your contributors will in exchange give me and other persons equally interested in these matters the benefit of their notes and remarks on reefs or lodes of any kind situated in other countries. Judging from the space given in your columns to cognate subjects, I am, you see, Mr. Editor, presuming that you will allot this interesting subject a column or two once or twice a month if satisfactorily filled. But to my reefs. At, say, 1000 ft. to the north of section No. 19 occurs this section (No. 21), in which will be seen that the main lava dyke splits up into three parts; one portion ran up the hanging-wall, a second through the centre of the quartz reef to rejoin the first at the top, and a third poured up a part of the way on the footwall. Above this section they pursue their way to the surface in three narrow streams. The small fault in the west leg indicated in section No. 19 is here become considerable.

Lava Streaks or Dykes.—The lava (basalt) at the top of section No. 21, where the two streams combine, is 5 ft. 7 in. in thickness, and the third stream just referred to 1 ft. 4 in. Here, again, I must acknowledge my indebtedness to the before-mentioned surveyor, Mr. Caleb Thomas, who has constructed for the Mining Department of Victoria most elaborate plans and sections. The lava dykes on the Garden Gully Reef have, it will be observed, followed up slides or fault lines, and cut across the slate and sandstone strata intervening between one saddle reef and another in their desirous rush to find an outlet at the surface for the pent up forces below. There can be little doubt the dykes have followed old fracture lines in the anticlinals of the strata, old slide or fault lines, and the walls of reefs; these places offering the least resistance to the pressure exerted by the molten lava.

Strata.—Before proceeding further with descriptions of the reefs on the Garden Gully line, I wish to make a few additional remarks about the strata. I have stated that the Hustler's Reefs occur in an anticlinal of the strata, and also the Garden Gully Reefs in an anticlinal, but I have not mentioned that there is only one synclinal or depression of the strata between these two anticlinals. Such is the case, and it is quite possible that the saddle reefs on the Hustler's line may occur in the same beds as those saddle reefs on the Garden Gully line. Judging from a rough examination of the outcrops of the strata between these two lines of reefs which I made, I am inclined to think these reefs do exist in the same beds. The faults on Bendigo, so far as I have observed them, are not extensive, and not likely, therefore, to cause much error in a geological section of this kind. It is possible, too, that reversed saddle-formed reefs might occur in the synclinal trough; but I fear there is not much hope of this, as no indication of any such a formed reef, on an extensive scale, has, so far as I am aware, yet been found on Bendigo. There was a small reef found in a synclinal fold of the strata which I observed on the Sophia Reef (north of Hustler's) in the early quartz reefing days, which ran parallel with the corrugations of the strata, and dipped with the strata to the north. To the east of the Garden Gully Reef lies the Paddy's Gully Reef; whether this is the tailing out of the eastern leg of one of the upper saddle reefs of the Garden Gully line of reef or the upward continuation of a synclinal reef I cannot say. I will, however give a sketch section (No. 22) of what I have just been referring to, so as to make more clear my views on this important subject. This section No. 22 extends for about a half mile from the Hustler's to the Garden Gully Reefs. Such a section as this could be most usefully extended from the Hustler's east to the Tyson's Reef, a mile or more, and from the Garden Gully west across the New Chum and other reefs to the Cape Clear Reef at the head of Long Gully. It is very many years since that I recommended the then head of our local mining department (Mr. R. Brough Smyth) to have this and two other like sections further north made of this Bendigo gold field. I also recommended longitudinal sections of the reefs should be compiled. After several years elapsed the longitudinal sections of the reefs and their cross sections were begun, and so far as this work has progressed it has been well done, and should be most useful to the mining managers and other persons interested. But the geological transverse sections yet remain to be made, and these will, I believe, throw even more light on the resources of the Bendigo Reefs than the longitudinal sections and be more valuable to the mining industry than the latter, as they would unfold more knowledge of the structure of this grand gold field and of its contained reefs, and prove an invaluable guide to the miner, capitalist, and prospector. Should, for example, the Hustler's and Garden Gully Reefs prove to be in the same bed or between the same strata then wherever to the east or to the west that same bed or those strata occurred in an anticlinal there rich gold-bearing quartz reefs might be sought for with reasonable expectations of success. So far as my observations have been conducted, I find that to the west of the Garden Gully there is an anticlinal before the New Chum Reef anticlinal is reached, and about midway between these two great master reefs. To the west of the New Chum Reef there is one well-defined anticlinal with a saddle-formed reef in it, and very probably another between it and the Cape Clear Reef at the head of Long Gully. It will thus be seen what valuable information is withheld from the mining public of this gold field until the geological transverse sections I have referred to are constructed. The present heads of the Mining Department will, no doubt, soon grant the Bendigo miners this great boon.

Melbourne, Aug. 21. WM. NICHOLAS, F.G.S.
Consulting Mining Engineer.

SILVER MINING INDUSTRY OF NEW SOUTH WALES.

SIR,—The latest and all-absorbing topic connected with mining in this colony is silver, silver. The recent discoveries have created quite a furore in mining circles. The rich finds in the far west—Silverton; in the south, in Sunny Corner on the mountains; and the latest in the north—Emmaville. Silverton is the excitement up till date, and is situated in this colony only a few miles east of the boundary line 141° east longitude, which divides us from the South Australian colony.

There are various routes to it from Sydney, and numerous deputations, composed of those interested along the line of these various routes, are daily appearing before the Minister of Works, urging on their route to be adapted, as, of course, these rich ores should find there way to the sea boards. The one most likely to be adapted is that one *via* Nyngau, Cobar, and Wilcannia, the distance being from Sydney to Nyngau 377 miles (railway opened already); Nyngau to Cobar 70 miles, site of the Great Cobar Copper Mining Company's mines and smelting-furnaces, 13 in number; Cobar to Wilcannia, 130 miles; Wilcannia to Silverton, 150 miles, or a distance of 727 miles from Sydney, of which 377 miles are already opened by railway for traffic. The copper mines of Nymagee, Melrose, and Hartwood will also be accommodated. The only rival route to this is *via* Hay, which is 454 miles railway (opened), Hay to Wilcannia 260 miles, and Wilcannia to Silverton, as before, 150 miles, or 864 miles from Sydney, leaving the copper mines of Cobar, Nymagee, &c., as before, neglected. So much for the route. Now for the district. Lodes of silver, lead, gold, bismuth, tin, copper, manganese, and iron have been discovered over a tract of land over 70 miles by 30 miles, and the metalliferous formation covers a much larger area. The geological formation consists of metamorphosed schists and indurated sandstones, traversed by numerous quartz reefs and metalliferous lodes. Most of the lodes are thin, and lenticular in shape, the largest yet discovered (Dunstan's) being 3 ft. in width, and 30 yards in length; the lodestuff is iron ore (gossan) and quartz, with copper carbonates. Several lodes show a little rich chloride of silver and lead ore. One lode (Farrell's) is from 4 in. to 12 in. wide, and contains rich bismuth ore.

The tin lodes of Poolamarra are sufficiently large to be worked alone. One of the claims has been called New Bischoff. The permanent silver lodes are Umberumberka, Lubra, Pinicales, Bobby Burns, Meeches Blow, Appollyon, Hen and Chickens, and Morris Blow; the latter is the richest, the former being the deepest—130 ft. The silver ore varies considerably, and is patchy in mode of occurring. The lodes of Corunna, 50 miles north-east, are chiefly manganese and iron ore.

Same gold-bearing reefs are being wrought by Boalt and party, 23 miles to the north. Sunny Corner Gold and Silver Mining Company, Mitchell's Creek, is about 110 miles from Sydney, and has long been wrought as a gold mine, and made princely fortunes to its owners. Not only is the virgin ore found to contain payable silver, but the tailings which result from crushing the top layer of the lode have been proved to contain highly payable silver. A 40-ton sample realised an average of 15*l.* per ton. There are something like 15,000 tons of such tailings at the battery, estimated at 250,000*l.* sterling. The lode varies from 6 ft. to 40 ft., and has a layer of partially decomposed quartzite on the hanging-wall, and from this layer the rich gold was and is now obtained. This 6 ft. layer was thought to be the only valuable part of the lode, but that theory is now thoroughly exploded by the manager by numerous tests. The tests have been confirmed by forwarding 467 tons to the English market, and realised an average price of 18*l.* per ton. Emmaville, the latest region in which silver has been discovered in the colony, is north of Sydney 425 miles; little has been done in this locality up to date. Of ten assays made by the Glen Smelting Company it ranges from 320 ozs. 13 dwts. to 673 ozs. 15 dwts. of silver to the ton. The chief ores found in the lode up to the present are—Galena, copper pyrites, mispickel, and a variety of grey copper, containing silver and gold. Much of the galena is fine grained, and has returned silver at the rate of 148 ozs. to the ton. IOTA.

Lake Macquarie, N.S.W., Aug. 15.

CANADIAN PHOSPHATE MINING.

SIR,—My attention has been drawn to some descriptive particulars recently received by me from Canada of the discovery and workings of some valuable phosphate mines situated at Otty Lake, near the thriving town of Perth, in the province of Ontario, and within two miles' distance of the Rideau Canal, and to this fact, that the facilities for transportation, both by water or rail, to the shipping port of Montreal makes it, without exception, a most convenient property for the shipment of this valuable mineral to the chief centres of consumption in England and the Continent. Of the apatite deposits of Canada, where phosphate mining is rapidly becoming to be looked upon by the investing English public as developing into a most gigantic industry, as already evidenced in Norway, Germany, and Spain, it may not be out of place to tender a few comparative remarks on that part of the British Empire within, as it is, a week's sail from England. Canadian apatite shipped to England has yielded for various lots from 75 to 85 per cent. of calcic phosphate, 80 per cent. being the average from the established and well-conducted mines, though lots from mines, where extra care has been used in the dressing and selection of the mineral for shipment have yielded 84 to 85 per cent.; but many of the small individual miners, who sell their products to local buyers, take but little pains in carefully sorting and dressing, and hence the product is apt to be of a much lower grade than that obtained from the before referred to well-conducted mines. But there is no doubt that regular and scientific mining and dressing will soon supersede the present crude plan adopted in many of the discoveries of working out the mineral from open cuttings and trenches, which are abandoned as soon as any mining difficulties are met with, and the process again repeated of opening out fresh places.

The Otty Lake property, alluded to in the opening remarks, embraces an area of no less than 1822½ acres of land, partly freehold property, and the remaining portion 1183½ acres being mineral concessions, held under mineral rights from the Government of the Dominion of Canada in perpetuity, and after a comparative survey of all the principal phosphate zones in West Canada by thoroughly experienced authorities are pronounced to be the most valuable yet discovered in that part of the world, indeed it is a great question whether such a similar phosphate mining property is at present extant. The concessions have been thoroughly tested and prospected, and found remuneratively productive, even with the present appliances, as over 7000 tons of phosphate of lime has been already obtained from the property, and imported into the Liverpool market. The apatite crops out and displays itself in immense masses on the surface, and not in 1-in. bands embedded in a hard strata like that of the Norwegian mines (however valuable those mines may be), but in well-defined lodes or veins from 3 to 8 ft. in width. At least 300 test shafts have been sunk in various parts of these concessions, varying in depth from a few feet to nearly 100 ft. All these shafts are sunk on the lodes, and in every case the apatite increases in width and density as depth is gained.

The deepest shaft—the one whose depth has reached 100 ft.—shows at the bottom a solid lode of apatite 8 ft. in thickness, thus proving incontestably that the apatite does exist in well-defined veins, and not in superficial pockets, which I observe is invariably the case in the numerous phosphorite mines which came under my notice during a professional visit to Germany a few weeks ago, and demonstrating the unexhaustible character of the mineral beyond all question.

The high quality of apatite obtained from these concessions will be gathered from the following analysis made by the well-known State chemist and assayer, Mr. S. Dana Hayes, of Massachussets, of four distinct samples, with a view to indicate the average of the bulk obtained:—Lot 1 (viii), 85·34 per cent.; lot 12 (vi.), 88·56 per cent.; lot 12 (v.), 86·13 per cent.; lot 19 and 20, 86·81 per cent. of calcic phosphate; but, perhaps, a more satisfactory proof in a commercial point of view may be given of the high value of the Canadian phos-

phates, by giving a few lists of analyses from actual shipments consigned to a Liverpool firm as being correct by both buyers and sellers as a fair test, and not just picked samples either from the mines or a cargo, a test so satisfactory that even a small error would make a difference to buyer or seller, of, perhaps, many hundreds of pounds sterling. I will give you a few only of these analyses; but I could largely supplement them: 84·48 per cent., 80·88 per cent., 81·88 per cent., 85·35 per cent., 82·94 per cent., 82·61 per cent., 84·12 per cent., 84·39 per cent., 85·62 per cent., 84·92 per cent. of calcic phosphate. Does not this prove that when cargo after cargo is landed in Liverpool with such results that Canada can produce an 80 per cent. phosphate? Can any other country produce a better average result? The German phosphates are of such a low percentage—35 to 40 per cent.—as will not admit of their transport to this country.

The Spanish deposits, or those that I examined in the province of Asturias during a recent visit, consist chiefly of crystalline cubes, disseminated in large bands or dykes in arenaceous rocks, and naturally these crystals when separated from the containing rock would simply be pure trebasic phosphate of lime. I might, however, add that owing to the difference in the specific gravity of such a high class apatite (which exceeds 200 lbs. to the cubic foot) and the matrix, there would be no difficulty in separating it in the same manner as metalliferous ores from their gangue. This, however, necessarily entails an extra cost to bring up the apatite to the necessary English standard. There can be no question as to the exceptionally high grade of the Norwegian apatite; but it must be apparent from the exceedingly narrow veins in which it is found, that very deep and expensive mining must be resorted to in order to obtain any appreciable quantity.

The combination of iron and alumina with phosphate is a very serious one, and I understand manufacturers can pass over (say) 1½ per cent. in these mixtures, but for every 1 per cent. beyond this they have to aim in their calculations at 2 per cent. more superphosphate. Now Canadian is very free from these combinations, especially that obtained in the Otty Mine, where the apatite is found in solid veins and masses, and which are blasted out tons in weight, yieiding without any dressing the high class grade required by the English market. I might further add that the price of apatite is regulated in the English market in a similar way to that of manganese, and to some extent like copper ore. For instance, whereas 45 to 50 per cent. would only realise 8½d. per unit, or (say) for 45 per cent. 1*l.* 12s. 9d. per ton, 70 per cent. would be 1s. 3d., and guaranteed 85 per cent. would realise as much as 1s. 5d. per unit, or 6*l.* 0s. 5d. per ton, being about 3½ times the value of 50 per cent. grade. The advantage of this will naturally be seen in such high class phosphates as those of Canada and Norway. The permanently increasing demand for phosphates may be gathered from the fact that contracts have been entered into for the supplies of as much as 1,000,000 tons of phosphatic lime, at a guaranteed percentage of 75 per cent. only. It is a well-known fact that all the hitherto principal natural guano deposits in various parts of the world are nearly exhausted, so the future extent which phosphate mining must eventually attain can hardly at the present moment be estimated, but that it will rapidly increase into one of the greatest industries of the world no one can doubt for a moment who has studied the subject. There is consequently a great opening for the Canadian produce, because it is relatively perhaps the cheapest phosphate in the market, and as the demand for it is increasing it will take a better relative position. There are shipments now on the way to Liverpool at freights of only 2s. 8d. per ton, so that it can be landed in Liverpool at a less cost than from any other country, sellers of Spanish already saying that they cannot compete with the price of Canadian. With your permission I will again revert to the subject on a future occasion.—*Liverpool, Oct.* 8. EDMUND SPARGO, M.E.

MINING IN NORTH QUEENSLAND—THE WILD RIVER DISTRICT.

SIR,—From the details given in the *Mining Journal* I am forcibly struck with the large amounts of money contributed in London and England generally to foreign mining matters in foreign countries. I can understand the enthusiasm displayed by speculators for shares in the Norway ventures, they being comparatively short distanced from England; but I fail to comprehend the thousand-and-one ventures in various localities in South America, while this colony—an English one—offers unprecedented guarantees for capital, possessing as it does certainly the most prolific tin lodes in the world, irrespective of its large deposits of gold, silver, and copper. Herberton district is situate from the coast between 50 and 80 miles, depending upon which route is selected to reach it; when the railway is completed it will be about the first-named distance. It contains some of the finest tin lodes in the world when compared with those described in your valuable publication, and the difference in the percentage of tin is very significant.

What I desire to intimate briefly is that more guarantee for British capital must be secured in a British colony than in the Republics of South America, especially as here in North Queensland the resources mean gold, silver, tin, copper, &c. We have no gold in the Wild River district—at least, none has been discovered yet. This metal is found at Gympie, Charters Towers, the Etheridge, and the Palmer; but we have undoubted tin lodes yielding the highest percentage tin in the known world, copper that assays 39 per cent., and silver assaying from 100 ozs. to 280 ozs. to the ton. We are exporting tin from this district alone to between 150,000*l.* to 200,000*l.* per annum, and in your London market we are unknown—unheard of. The percentage dressed tin from this field ranges from 79 per cent. to 90 per cent., and we have an unlimited supply if capital were introduced. The conveniences for transmission to Europe are now easy by the B. and I. steamers, which ply through Torres Straits monthly, and the rates of freight for ores or metals are very liberal. I shall in future send you regular communications from this very much favoured tin, silver, and copper field. My object in opening the communication is to bring under the notice of English speculators and metal brokers—firstly, our existence; and, secondly, our extensive resources, and to impress upon English metal and mineral speculators the advantages to accrue by sending their capital to Northern Queensland, as compared with the disappointments they experience and the risk they run by venturing it in alien countries. Northern Queensland can offer to English capitalists as good gold as any part of the world; they can give them better tin, better copper than they can produce elsewhere, as shown by the higher price accorded to Australian than Chilian.

What I desire, first, is to introduce through your valuable columns the name of the Wild River tin field lodes; and, secondly, to show that in North Queensland minerals of every description can be worked with English capital with far less risk than with foreigners, which means a better security for investments. The matter, Mr. Editor, lies with you whether the Wild River mineral district is to become better known amongst English capitalists. EDWARD MYERS.

Herberton Advertiser Office, Wild River District, Aug. 15.

NICKEL MINING IN GERMANY.

SIR,—Owing to the almost unprecedently low price of the commoner metals, especially lead, copper, and zinc, and the rapidly increasing extent to which the process of nickel-plating is being carried out on the Continent and in England, as well as in the United States of America, considerable attention is now being directed to the nickeliferous mines of various parts of Germany. One of the oldest and, perhaps, the most extensively developed nickel mines in that country are embraced in the Gladenbach mining concessions belonging to Mr. George Dahm, an extensive metal merchant of Cologne, by whom the well-known mining engineer of Liverpool (Mr. Edmund Spargo) was lately engaged to examine several of the most important of the existing workings. The principal mine is known locally as Ludwig's Hoffnung, which is located only 2 miles from the town of Gladenbach, and in close proximity to two large villages, where there is any required amount of accomodation for workmen. These mines can be reached from London *via* Cologne and Giessen within less than 24 hours

Some years ago the produce of nickeliferous ore from these mines were so large that an extensive smelting and refinery works were erected expressly for the reduction and treatment of these ores at a considerable outlay, and it is said that the proprietor of the mines and smelting works realised an immense fortune from their development, retiring from old age when the works were disposed of. The treatment of the ores were subsequently entrusted to hands sadly wanting in metallurgical knowledge. This, with the caving in of some of the deepest workings of the mine, ultimately resulted in their falling into the hands of the mortgagee (Mr. Dahm), who knowing the value of the property not only intends resuscitating the old mine, but has immensely enhanced its value by the addition of numerous concessions now amounting in the aggregate to 24,000 acres.

These mines have been examined and reported upon by several well-known German mining engineers, among whom may be mentioned Mr. Gustav Roetzel. Mr. Spargo, in his report, says that the nature and irregularity of the old workings at first sight tend to impress one with the fact that the nickel ores seem rather to be found associated with irregular masses and upthrows of quartzite dykes; but that, upon closer examination, and a general survey of the ground for a mile or more upon what seems to be the normal bearing of the old workings there is sufficient evidence to show that they are but the outcrop of immense fissure veins, and that the ores already obtained are only a prelude to far more deeply seated treasures.

Although enormous quantities of nickeliferous ores have been obtained from these mines none of the workings exceed a depth of 60 ft. The lode in places was over 20 ft. wide, and in some cases worked in an open-cast from the surface. The ores are found in a hard quartzite gangue, and associated with a pale coloured pyrites, and sometimes worth 2 to 4 per cent. of copper, and yield at the present shallow depth as broken from the lode about, or, perhaps, over 3 per cent. of nickel. This grade ore is now being profitably treated, not only on the Continent, but extensively in the United States. Mr. Spargo estimates the cost (based as to the smelting charges upon actual treatment of these ores) 3*l.* 6s. per ton to mine and reduce 3 per cent. ores to 50 per cent. regulus, which, upon an output of 5000 tons per annum of 3 per cent. grade only would yield a profit of 7500*l.*, estimating the value of the pure nickel at 1s. 9d. per pound only.

The activity shown by Mr. Dahm in these concessions are already beginning to show fruit for the district, as the owners of a small concession obtained recently on the borders of his concessions have discovered a parallel nickel lode of great extent, and from which large rocks of nickeliferous ores are now being obtained. This lode runs immediately into and traverses Mr. Dahm's concessions, which, as other important discoveries in copper, yielding 32 per cent. of metal, have also been recently made adjacent thereto, it is ere long likely it will develope into a new and distinctively important mining district.—*Low Hill, Oct.* 8. A. A. B.

SOUTH AFRICAN DIAMONDS—THE KIMBERLEY MINE.

SIR,—As I cabled you on Sept. 10 the serious fall of reef which had that morning taken place in the Kimberley Mine, I now write you fuller particulars. In November of last year a heavy fall of reef took place, causing much loss to the companies on the north side of the mine. The bulk of reef did not, however, reach any great distance into the mine, but rested on the hard rock overhanging the whole of the north side

For some weeks pass it has been known that a forward movement was likely to take place, or, as it is termed here, "a subsidence." On the morning of Sept. 10 the movement took place, and at least 900,000 loads (of 16 cub. ft.) was displaced, carrying with it the standing wires of all the north-side companies, besides doing great damage to the valuable underground workings of the Central Company, destroying the upper portion of their shafts, closing their workings, and almost entirely covering their ground. The reef continued to move forward, and by night had left little of the deep working in the whole mine uncoverable.

There can be no doubt that this disaster will bring about almost immediately the amalgamation of the different holdings; in fact, for some time past a desire has been shown by owners to give the matter their earnest consideration, and now it is admitted on all sides as the only course open. The directors of the Central are moving to bring it speedily about. This company, who have just secured the services of Mr. Hendricks from England, have begun the sinking of a shaft outside the mine, on the north side, and when sunk to a depth of 900 ft. will tunnel through the hard rock, and they hope within seven months to be again hauling blue from their underground workings, which are still intact. The reef difficulty will thus be overcome, and the annual enormous expense of removing saved, to say nothing of the loss hitherto sustained by companies being unable to work their ground.

The Central Company, out of their newly amalgamated ground (Rose Innes), are hauling 900 loads of blue daily, and the French and Standard will be in a position to haul next week. With the exception of Kimberley Mine the others are all in full swing, and most are paying substantial dividends monthly and quarterly, the De Beers Company taking the lead. CORRESPONDENT.

Kimberley Diamond Fields, Sept. 13.

BRITISH ENTERPRISE ON THE GOLD COAST.

SIR,—I am very much pleased to see that your Journal has caused some kindred feeling in the minds of the mining propensity for the Gold Coast, undoubtedly one, if not the best gold properties ever prospected. "N. R. H.'s" letter in last week's *Mining Journal* is to the purpose, and needs no comment, waiting reply. It is refreshing to have a few lines after a long silence from the energetic Mr. Gowan, the first date Aug. 12, and the second Aug. 17; the latter of which appears in last week's Journal. But what has become of the other mines which were so promising? Take them in rotation—the French Company, Effuenta, Akankoo, Wassau, Halfa, and the Tacquah, &c.—are they in existence, and who profits by them? This is not an age to slumber; let the shareholders arouse themselves and join in the management of their own affairs; surely there are some persons who can explain this transition state of things. I would suggest that the shareholders of the different companies should amalgamate in searching and publishing the past and present state of affairs, and put the whole thing in a healthy and paying condition.

It is not a question of there being gold in paying quantities; it is the apathy of the shareholders in allowing the favoured few to help themselves. There is such a thing reported as plant, machinery, stores, &c, being lost in the river between Axim and the mines. "Did they ever exist?" These and other matters, such as champagne, claret, &c., sent out, which I am informed by a gentleman who returned from there to—"Drink them was poison." I would willingly join issue with the shareholders in forming a general committee, to be called (say) "The Gold Coast Protective Association." And I am thoroughly persuaded nothing is required but men of business habits at the helm to make a grand success. There is a grand gold field open there.—*London, Oct.* 8. E. W.

THE GOLD MINES OF INDIA.

SIR,—Mr. Plummer's success at Mysore shows the advantage of employing a good sound practical miner, as well in gold as in any other mining enterprise. May not other of the gold mines in that district as well as in other of the Indian gold mining districts have failed only because the so-called miners of the present day have been content to rest on top of the ancient workings instead of finding the bottom thereof. I would not be much surprised if this proved to be the case. In some cases it is just possible that there has not been sufficient work done to show the ancient mining works. In the enervating climate of India the spur of self-interest is required with some men to induce them to do any work at all. That English miners can do good work in all climates their past achievements and present enterprise sufficiently show. And yet I have seen French miners who have seemed better able to stand hard work in a hot country. I have also seen Italian miners working well under an African sun, where most Englishmen would be tried to the utmost, if indeed they could work at all to any effect. I speak of the working miners, not of the managers, who have the direction of the mode of working and the laying out the mines. This class have held and can hold their own anywhere; but they cannot always find English workmen who can stand heavy mining labour in very hot climates. Consequently they have to depend much on unskilled native labour in the gold districts of India, and in this case close and incessant inspection devolves on themselves.

Under such conditions any defect on the part of the manager himself, whether it arose from want of practical skill or lack of vigorous health, which prevented his incessant watching the progress of the work, might be fatal to the enterprise, although the gold may be just under his feet. Mr. Plummer's success at Mysore, and the circumstances under which that success has been achieved, renders the sharp looking after other gold districts of India of the very greatest importance.

The very interesting articles of your Melbourne correspondent, Mr. W. Nicholas (Lecturer on Mining in the University of Melbourne), respecting the golden quartz reefs of Australia, showing as they do for how long the deep gold quartz reefs of Bendigo had been passed over, and the great success following their development, seems to show the probability of deep gold quartz reefs in other waning districts, and the grave importance of a re-examination of the whole question of the gold mines of India.

Redruth, Oct. 9. W. TREGAY, M.E.

TIN IN BAJA CALIFORNIA, MEXICO.

SIR,—For some years it has been well known that the Cocopa Indians have brought in here from the Cocopa Mountains, 60 miles east of here, very fine specimens of tin ore (cassiterite), one piece of which weighed 314 lbs., which showed by its breakage to have been broken from the vein, and not found as "float." The exact locality of this vein is known, but on account of the Indians occupying and owning the country nothing has been done towards even locating or denouncing the mine under the Mexican Mining Laws.

For two years or more a large vein of good looking ore or rock has been seen standing out boldly from 3 to 5 ft. above the surface of the ground, from 6 to 10 ft. in width, that could be traced for more than a mile in length. Being out of the usual road or trail travelled by miners and prospectors, but little attention was paid to it until the discoveries of the large nickel veins near this place, when parties that knew of its existence took samples of the rock and sent them to San Francisco and San Diego, California.

The assayers reported from 18 to 38 per cent. of tin in the ore according to sample. The pay-streak of tin ore is about 2 to 4 ft. wide. Samples taken from different portions of the opposite side of the vein from the tin gave 8 ozs. in silver, with none or but very little tin—only a trace in most cases.

This discovery has caused quite an excitement both sides of the boundary line in the United States as well as in Mexico. It is found in the same range or belt with the same formation as that of the Temascal Tin Mines, near Los Angeles, California. Baja California, the north-west corner of Mexico, with its many gold, silver, and lead mines, its hundreds of copper veins yet untouched, its nickel, mica, sulphur, and alum, and now its tin mines, must enter into competition with the best mining districts of the United States and Mexico, if not with those of England and other portions of the old world. D. K. ALLEN.

Real del Castillo, Baja California, Sept. 15.

DAKOTA TI .

SIR,—Having recently answered one of the leading miners of Cornwall as to the correctness of the following statements about tin discoveries in Dakota, and thinking that many of your readers will also feel great interest in the subject, I forward this synopsis for publication:—"The Professor states that he has seen veins of it more than 50 ft. in width." . . . "That the deposits there are so vast as to be able to supply the whole world for centuries." . . . "The tin-bearing rock can be quarried from the surface." . . . "The stream tin alone is so abundant that all the companies that could possibly work it could go on for 20 years without exhausting it." . . . "Yet this is the waste, you may say, of the main deposit; the mere scraps that water and frost have detached, a little bit at a time, from the great mass and source of the ore, which is Harney Peak itself, more than a mile high, and the surrounding tin-bearing rock, which, as I have already said, extends for miles. It is impossible to imagine this great body of ore ever being exhausted."

The above statements have appeared in many local and foreign papers, and after allowing these absurd puffs to pass, far over and away, like cirrus clouds, we may quietly winnow these wonderful discoveries at our feet for actual bed-rock facts. We have neither examined nor seen an estimate of the property by any other practical and experienced tin miner, and, therefore, must judge from the more consistent general statements published, and the following pertinent features of the region may be held to view for consideration:—1. This tin ore is not found in lodes, but appears to have been deposited in occasional carbona-like pockets, or in spots throughout the highly micaceous granitic country, or bed-rock, of the Harney Peak Mountain.—2. The country surrounding this peak is not of a granitic character, and, therefore, many outside errors have been made in discrimination, and the actual discoveries of tin therein were but trivial.

It is absurd to suppose that the whole of the non-congenial surrounding country rock has any stanniferous value.—3. The original Etta Mine, now owned and worked by the Harney Peak Tin Mining, Milling, and Manufacturing Company, of New York, is the only one that can thus far claim even a prospect for ultimate success, which will, however, require much labour and time to decide.—4. Notwithstanding the startling statements for the region, the workable ore of this mine is now estimated by Professor Blake at only 3 per cent., and which may be lessened by further trial or excavation.—5. This company has obtained the right to work the stream-tin gulch's which diverge from and drain this Harney Peak. The assortment of ore at their New York office exhibits the remarkable peculiarities of unusual blackness, excess of mica, and freedom from any rusty stain of oxide of iron, and these, though favourable for the ore itself, will not be considered "kindly" by miners for future abundance.—6. If this mine should really develope even more tin ore than any Cornish mine ever has done, the difficulties of close concentration will be as much greater here for want of your educated cheap labour of from 1s. down to 4d. per day for the surface work, dressing, and preparation of tin ore for market, that profits would not, by any means, be the certain result.

7.—American machine-concentrators, though good enough for purposes of gold and silver mining, because they retain all the heavy minerals and metals, are not sufficient for tin oxide, which must be separated from even the very last, most stubborn, associate by water, fire, and sometimes acid methods, already well known to your tin-mining readers, or the smelters will not buy the ore. Such American concentrations, may, however, be shipped for superior concentration and sale in Cornwall more profitably.

8.—The U.S. miners, with their eyes so well practised for gold, have far too exalted notions as to the ready value of tin ore, which is, in round numbers, worth about 1-60th of silver, whilst dressing and reducing labours are equally expensive.

9.—Just now another excitement is being wafted through the air of tremendous discoveries of tin in the State of Virginia, as in California a few years ago, where on being consulted I correctly advised them to drop their elephant.

For these and other reasons it may be safely asserted that Cornubia is not in imminent danger of being driven from home, and the Cook's Kitchen Mine of 200 years may still endure as long as these monstrously over-rated discoveries.

Its miners may, however, greatly improve their present condition and secure future standing by introducing expansive steam-economy in their large hoisting-engines, by also using small, suitably arranged iron winze-men for underground hoisting, which, from ever ready and continuous non-tiring work, and the respiration of pure compressed air, would save the driving of many unnecessary 10 fm. levels, and so thoroughly ventilate the distant sections of mines, that works which are now most difficult would become easy and much more expeditious for both excavation and extraction.

Do all towards greater economy for deep development that is possible, as every shilling thus saved is actually a net gain for lessening calls or increasing dividends. J. S. PHILLIPS.
State-street, New York, Sept. 30.

LEADHILLS.

SIR,—The Chairman of this company is generally cheery—often rather prophetic—at the annual meeting. He calls up the captain; he calls up Mr. Newbigging, and prattles away of what they will do. This year he could only tell us of an extraordinary spring of water that has benefited a large number of people, and hopes many of the shareholders will visit it, for he is sure they will be pleased. What a virtue there is in this water—it will sweeten even an eighteen-penny dividend. The captain is not up to the mark this time; he does not even put in an appearance.

What else could you expect from the Chairman in these dull times? He has only "cauld kale" to offer them. He recounts to them the "good old times" when they got 32*l.* a ton for their lead; he is even careful to estimate the profits they would have made had they been getting that price. Even if they had been getting the 16*l.* 10s. they got 10 or 11 years ago, they would have been getting a profit. He might have added that if they had had the 60,000*l.* which the syndicate pocketed from the shareholders, they might have been getting a still better profit.

What makes the Chairman "harp" about a reduction of lordships? He must know that the lordships are moderate, and that it is out of the question to talk of a reduction. The lordships are only 22s. a ton, while the directors and secretary divide among themselves 9s. 5d. a ton for their services, besides the money paid to managers, engineers, &c. Thus, the output of lead for last year may be set down as 1700 tons. I find the directors' fees are 600*l.*, which amounts to 7s. 1d. a ton of lead.

The secretary gets 200*l.* a year, or 2s. 4d. a ton. The commission on lead sales is 157*l.*, or 1s. 10d. a ton. There is an item of 1183*l.* for engineering. I do not exactly know what this means, but it adds 13s. 11d. to the ton of lead. These make a total of 25s. 2d. per ton, and I should like to direct the attention of the directors to making a reduction on them.—*Glasgow, Oct.* 9. R. T. M.

SHROPSHIRE LEAD MINES.

SIR,—There has not been so few miners employed in this district at any former time in our day as there are at work at this time, and this is not due to the poverty of the mines, but the low price of lead. I hope the market will continue to improve. At Snailbeach they have a few hands on clearing the broken stuff out of the mine, and a few on the floors dressing, and we hope the company are reforming, and will soon resume operations on a larger scale than of late. The rich old mine well deserves it, and we hope the shareholders will not lose heart just in these few years of bad times after they have had handsome profits. They have a good mine still, and a good outfit of machinery and a tramway to the mine, so have nearly everything they will need for efficiently working the mine. With a better price for lead, Roman Gravels Company would have good times of it, having an extensively rich mine and a splendid plant.

The plant at Ladywell was offered for sale by auction the other day, but we understand no part of it was sold, and the miners in the immediate neighbourhood were highly pleased with this result, for they all say the machinery ought to be left where it is to further develope that very promising young mine. We never hear a word now about the winding-up of the East Roman Gravels Company. We understand that the men working there at the time it was stopped are owed a very considerable amount for wages. I think there is such a thing as the miners being too quiet in such cases. They ought to press for payment, and the company's effects should be sold, and the men paid as soon as ever possible. A few miners are opening adit levels at Hope Valley Mines on tribute, where it is expected they will find some pretty good pitches. MINER.

FOREIGN MINING AND METALLURGY.

A price of 6*l.* per ton for merchants' iron appears to be now firmly established at Paris, as, in spite of all efforts in a contrary direction, consumers have refused to do business upon higher terms.

In the Nord No. 1 iron has made 5*l.* 8s. to 5*l.* 12s. per ton. There has been a tolerably regular current of small orders in the Nord, but some proposals for relatively heavy contracts have been carried through with difficulty. The Orleans Railway Company is about to let contracts for 25,000 tons of rails. The specifications in connection with this contract are stated to have been prepared so as to expressly exclude works producing rails by dephosphoration. Some heavy orders are expected to be also shortly given out by the French artillery and naval services. In the centre district the Montluçon Company has just extinguished a blast-furnace. This is the second furnace which has been extinguished during the past month. The Saint Jacques Company has also blown out the only one of its furnaces which remained still in operation. In the Rhenish province and in Westphalia, the demand for pig has been sufficiently strong to give additional strength to the rates current, but no advance has been at the same time attempted. Orders for iron have come to hand tolerably regularly in Germany, and some of the works have continued well employed. The production of pig in the German Customs' Union in the first eight months of this year was 2,384,023 tons, as compared with 2,235,872 tons in the corresponding period of 1882.

It had been anticipated in some quarters that some large orders received on foreign account by some of the principal Belgian works would have exerted a favourable influence upon the Belgian iron trade generally. Unfortunately, however, this anticipation has not been realised, as, with the exception of the privileged establishments which obtained the orders in question, most of the Belgian works are only living on from day to day with the help of a few small contracts which are obtained with difficulty, and only by means of certain concessions. A contract has just been let by the Municipality of Rotterdam for 4000 tons of pipes required for gas-lighting purposes. Various English, French, and Belgian firms competed for this contract, and the lowest tender was submitted by the La Louvière Blast-Furnaces Company. The Marquise Company, a French undertaking, submitted the next lowest offer. The English firms which tendered do not appear to much advantage in the competition. English casting pig has made 2*l.* 2s. 6d. per ton upon the Belgian markets. No. 1 iron has been quoted in Belgium at 4*l.* 10s. per ton for exportation, and 4*l.* 12s. per ton for local consumption. No. 2 has made 4*l.* 16s. per ton, and No. 3 5*l.* 2s. per ton. Girders have been quoted at 4*l.* 16s. to 5*l.* per ton; No. 2 plates have made 6*l.* 4s. per ton; and No. 3 ditto, 7*l.* per ton.

Contracts for coal required for the Belgian State Railways have just been let. The prices at which these contracts were let were extremely low, but this fact has not exerted much influence upon the market, as the period of the year has now arrived when higher rates may be anticipated for household coal. In the week ending Sept. 28 18,280 trucks carrying coal and coke passed over the Belgian State Railways, as compared with 18,962 trucks in the corresponding week of 1883. The Belgian Railway Department has brought into force this month reduced rates for the conveyance of coal to Switzerland and the North and East of France. Although the season has continued extremely fine, the Paris coal market has continued to show a certain activity; this has been due to the course pursued by some private individuals, who have shown a disposition to the business at current rates. According to M. Veillenun, the consumption of coal in France in 1882 amounted to 31,015,000 tons. This total was made up as follows:—Ironworks, 6,353,000 tons; railways, 3,061,000 tons; working of mines, 1,234,000 tons; steamboats (not including war steamers), 749,000 tons; and miscellaneous industries and domestic consumption, 19,618,000 tons. Coal mining continued to develope itself satisfactorily in the basin of the Loire last year, the production of the 12 months having been 45,645 tons in excess of the corresponding production in 1882. The movement of German coal to Italy in August amounted to 5470 tons.

FIRST AID AFTER COLLIERY ACCIDENTS.

At the recent Social Science Congress Surgeon-Major GEORGE A. HUTTON read a paper "On Facts and Figures connected with First Aid, and the Carriage of Sick and Injured Persons." Speaking of accidents in coal mines from explosions the author said that there existed a popular fallacy in the mining districts that the smell of fresh turf revives those suffering from the noxious gases, and that he had heard of persons who had been brought to the surface after an explosion being laid face downwards over small holes dug in the turf that they might recover. The evils of such a popular fallacy were apparent, and the knowledge of useful and simple "first aids," such as may be acquired by all, might be the means of saving many lives.

Treatment consisting of friction, with the dashing of cold water over chest and face, and encouraging respiration by working the chest in imitation of it, and the giving of mustard emetics was found useful in such cases. These sort of accidents are not alone confined to coal mines, he said, but are of frequent occurrence at furnaces for the smelting of iron ore; they may and do take place in common sewers, at gasworks, and in the hold of ships, and since instruction in first aid has been given, dispelling the fallacy referred to, many valuable lives have been saved. In one case at Middlesborough-on-Tees eight men were suffocated in the hold of a ship by a fire among some lucifer matches. They were extricated with difficulty, and doctors sent for, but owing to the early hour of the morning it was over an hour when medical aid arrived, by which time all the men would have been dead had it not been for the dock company's men, who had received instruction in first aids, and resorted to means for inducing respiration, which was successful in the restoration of the whole of them. Take another instance—one of dangerous bleeding. A boy is cutting a cabbage-stalk, the knife slips, and enters the main artery of the thigh; no one present knows what to do, and in a short time he is dead. At the inquest the doctor says this life might have been saved by simple first aid knowledge. As a counterpart to this a working pitman has the same artery wounded; his comrade, an ambulance pupil, places pressure above the wound, stops the bleeding, and saves the man's life.

The author continned to say that did time permit he might relate numbers of cases of a similar kind, but he must pass on to the carriage of sick and injured persons. After speaking of the usual way of carrying men who were injured in the mines he referred to cases where proper ambulance stretchers and wheeled litters were used, and where men were instructed in the use of them. He, while looking upon this ambulance work principally in its highest sense as humane and Christian work, did not forget that it was intimately associated with our social economy, and through this it had a close connection with the national health and national wealth. As illustrative of this he narrated the case of an artisan hurt in the beginning of February. His injury was a simple fracture of the leg, but he was carried home so carelessly that the injury was complicated by a serious displacement of the foot, which has acted so seriously that a limb which would have taken three will now take at least seven months before it is well. Now the man was in receipt of 30s. a week, but, of course, during his illness, that is stopped, and instead he gets 10s. a week from the Employers' Liability Assurance, and 5s. a week from the sick club; total, 15s., as against 30s., which means less food, less clothing, less of the actual necessaries of life for his family. Besides this there is a loss to the employer, and also to the productive labour of the community. In conclusion, the author said he looked upon this question as a working-man's question, as he was most liable to accident, and the missing link that existed between the time a person is first injured and the arrival of medical aid might be supplied by the use of wheeled litters and stretchers, and the instruction of persons how to use them.

ANGLO-HUNGARIAN COMMERCE, AND MINING.

Hungarian trade is active with respect to Western European countries, but passive to the Danubian countries. Great as is the part which Austria plays in Hungarian commerce, there is, writes Consul General PHIPPS, from Pesth, little doubt that it is, to a very large extent, an intermediary for Hungary, both with regard to imports from and exports to other countries. Hungary, in this respect, probably plays the same part of intermediary as regards exports to the various Danubian and Balkan countries. It cannot be doubted that British goods to a value of far more than 324,000*l.* find their way to Hungary, and are included in the amounts credited to Germany and Austria. For instance, English agricultural and other machines, to a value of about 240,000*l.*, entered Hungary last year. I have been at some pains, he continues, to ascertain privately what English manufactures are principally imported into Hungary, and to learn thus what articles are able advantageously to compete with German manufactures, which are submitted, of course, to the same duties, and with Austrian manufactures which enter the Transleithan kingdom at present free.

It has been pointed out to me that one great disadvantage under which British trade labours is that the English manufacturers are not, like the Austrian and German, in direct communication with the wholesale dealers here. Most of the English dry goods sold in Hungary are obtained through Austrian intermediary. Even those have probably not been obtained direct from the manufacturers, but have passed through the hands of one or more agents. Each of these must of course, obtain some profit, and the result is that the competition with Austria and Germany cannot be maintained. I believe that a much larger trade in Manchester goods and British industrial articles might be developed if English manufacturers could enter into more direct connection with merchants, and send their goods straight to Hungary. Her Majesty's Consulate-General has frequently been in a position to afford valuable information to British merchants with regard to the respectability or material position of importers and merchants, and would gladly continue to supply such information when possible to afford it.

Hungarian industry is making progressive improvement. It is declared to show prosperity, and to be making energetic efforts to take the position which foreign competition has hitherto maintained. The furniture manufacture, the production of china, majolica, and bronze, are stated to exhibit signs of progress which a few years ago could not possibly have been anticipated. In the building trade Hungary is said to be entirely independent of foreign assistance. In other great branches of trade the power of production is showing gradual improvement, and the number of factories steadily increasing. In iron industry the progress is the most remarkable, while in the manufacture of agricultural machines the Hungarians are, according to the Pester Lloyd, enabled seriously to menace the almost monopoly possessed by the English importers. However this may be in the future, it cannot be denied that at present the importation of English agricultural machines is increasing. Last year no less 611 sets were imported by the following firms:—Clayton and Shuttleworth, 183; Ransomes, 88; Hornsby, 77; Ruston and Proctor, 68; Marshall, 60; Robey, 36; Foster, 35; Garrett, 32; Broson and May, 16; Gibbons and Robinson, 16. A German company supplied 8, and a French company 2. The above cost, when complete, on an average 5600 fls. The only locomotive threshing machines as yet made in Hungary are, I believe, those turned out by the State factory, numbering last year about 110, and costing about 500 fls. less than the English machines. I believe that it can be safely asserted that Hungarian agriculturists give a preference to English machines owing to their superior durability. They are all imported *via* Hamburg, and nearly all those sold in Roumania, Servia, and the Balkin countries are purchased in Vienna or Pesth through agents.

The principal iron foundry and machine manufactory is that of Ganz and Company, which enjoys especially a reputation for the construction of railway wheels. They furnished in 1883 about 21,000 for railway trucks and carriages, and over 10,000 for tramways, mines, &c. They also sold nearly 4000 tongues for railway crossings (frogs), being about double the amount of the previous year; 1772 rollers for cylinder mills, of which a large number were sent to Italy and Spain, and the rest used in this country; railway wagons, 1900 against 1100 in 1882. The factory used in 1883—Raw iron, 99,000 metric centner; wrought-iron, 28,600; iron girders, 22,600; Bessemer steel, 6400; plated metal, 6230 metric centner, Schlick's iron foundry employed on an average 820 workmen in 1883, against 517 in 1882, and 385 in 1881. They used 59,740 metric centner of iron against 44,598 in 1881, and sold goods to the value of 120,000*l.*, principally agricultural machines, steam ploughs, threshing machines, &c. The Prager Machine Manufactory (Branch) prepared several steam and other ships for use on the Danube.

The Hungarian iron industry, with regard to which I supplied full details in my last report, has enjoyed one of the most prosperous years on record, principally owing to the good harvest and to the activity in the building trade in the capital. But the export to the Balkan countries has almost ceased, principally owing to the favourable tariffs accorded by the railways to the transit trade from Germany. That country is stated to monopolise the iron trade with Servia and Roumania, and the Hungarian ironmasters can only compete at a loss. When, however, the stagnation in the German inland iron market has ceased, and the tariffs are rectified, it is hoped that the export from this country may be resumed.

The import, export, and estimated consumption of coal in Hungary during the year 1883 was—Produced in Hungary, 2,000,000 tons, value 8,000,000*l.*; imported, 397,651, 4,224,458*l.* = 2,397,651 tons, value 12,224,458*l.*: deduct amount exported, 68,612 tons, value 305,358*l.*; leaving the Hungarian consumption, 239,039 tons, value 11,919,100*l.* This, however, is a mere estimate founded on data privately collected in 1880. With regard to importation it is probably not reliable, for no account is kept of the coals imported from Austria and abroad in railway tenders for immediate use, nor the quantities of coal brought into the country in the Danube steamers. In 1879 there were in existence in Hungary 111 coal mining undertakings, small and great, employing 10,618 persons, and producing 1,685,964 tons of coal, of an estimated value of 6,619,920 fls. Of these 111 mines only 40 are of any importance, the remainder being small undertakings for local necessities, employing two to 10 workmen each.

As to the origin of the coal imported into Hungary it appears that according to the Statistical Bureau Austria supplied about 250,000 tons; Germany about 7500; Great Britain sent to Fiume in 1883 about 20,000 tons, valued at from 22s. to 24s. per ton in Fiume. It may be mentioned that the Prussian coal fields are distant about 540 kilom. from Buda-Pesth, while of the Hungarian coal fields that of Funfkirchen is 240 kilom.; that of Salgo-Tarjan, 125 kilos.; and that of Gran, 70 kilos. from Buda-Pesth. The development of the Hungarian port of Fiume during the last few years has been very remarkable. The commercial movement of the port during the year 1883 was represented by 6922 ships with 1,165,665 tons, which shows an increase over 1882 of 799 ships and 195,928 tons; over 1881 of 1527 ships, and 260,257 tons; over 1880 of 1580 ships and 382,735 tons; and over 1879 of 1694 ships and 413,365 tons. In the last five years, consequently, the number of ships has increased by 24·5 per cent., and the tonnage by 52·7 per cent.

In 1883, 1085 steamers with 417,447 tonnage, and 2392 sailing ships with 166,425 tonnage, entered the port. Of the steamers 935 bore the Austrian-Hungarian and 144 the English flag. Of the whole traffic of the port steamers and sailing ships, the Austro-Hungarian flag was represented by 67·2 per cent. of the number of ships and 61·06 of the tonnage, while to the English flag is credited 4·42 per cent. of the ships and 27·40 per cent. of the tonnage. A remarkable circumstance in the trade of Fiume is the increasing frequency of sailing ships in the port. This is to be accounted for by the fact that a very considerable timber export as well as the import of petroleum for the refinery established in the town are effected in sailing ships.

LIVERPOOL UNIVERSITY COLLEGE.—The new session was opened on Oct. 3, when Lord DERBY presided, and among others present were—Mr. Samuel Smith, M.P., and Mr. J. A. Picton, M.P. Special interest attached to the occasion from the fact that it is the Jubilee year of the Liverpool School of Medicine. The Principal having made his annual report, an address was delivered by Prof. MacCunn, in which he indicated the work which the College had before it, illustrating his remarks from the experience of Scotch universities. Lord Derby then said that other occupations kept him away from Liverpool, and compelled him to neglect those duties which otherwise it was his pleasure to discharge. The progress of the College had been steady, rapid, and continuous, and the last important event connected with it was the amalgamation of the Medical School with the College. The Medical School, which had behind it an honourable record of half a century of useful and valuable service, had consented to begin a new existence as the Medical Faculty of the College. He had heard with peculiar interest what Prof. MacCunn had told them about the Scotch universities. Scotchmen got on in all parts of the world. They were seen everywhere except in the workhouse, and what they had just heard threw some light on that peculiarity of their character and condition. He did not say that their universities were the cause of their success. They were probably only one cause among many. The cause of their success was the spirit which created those universities, and which would not be satisfied without proving all that could be known and doing all that could be done. If they equalled them in energy he did not see any reason why they should fall short of what they had accomplished in that line, and Prof. MacCunn would have done them very useful service—supposing they were able to bring a little of what they had accomplished in the three years—in showing them how much there still remained to be done. He agreed with what the lecturer said about the value of a degree. It was perfectly true that the degree was only the stamp, but after all it was the stamp and the printing upon it which made all the difference between a banknote for 1000*l.*, and a rag of paper worth some fraction of a farthing. No doubt it was possible that the limit for degrees might be carried too far, that they might become the sole interest, and not merely a subsidiary object. There was a great deal of talk a few years ago about the endowment of research in the universities, and somebody suggested that the words ought to be turned round, as a good deal said about the endowment of research meant the research of endowment. Lord Derby then proceeded to deliver the prizes.

MANCHESTER ASSOCIATION OF EMPLOYERS AND FOREMEN.—On Saturday last the members of the above association made an inspection of a new patent electric tramcar and line constructed by Mr. HOLROYD SMITH, of Halifax, and which has been put down experimentally in an open field in the outskirts of Manchester. There was a large muster of members, and considerable interest was manifested in the new car and line, which was worked in a thoroughly successful and satisfactory manner with full loads, as many as 35 members being carried in one journey on the car over the experimental line. The arrangement of this electric tramway may be briefly described as follows:—In the middle of the track is a third rail with a narrow slot or groove, below which are two half tubes of copper about 3 in. apart. These tubes, which extend the whole length of the track, are the electric conductor, which receives the electricity direct from the dynamo. Within the conductor is placed the collector. The collector moves as the car moves, and conveys the electric current to a motor beneath the floor of the car, and the motor as it revolves turns the car wheels. The motor is of the usual pattern, and revolves at a high velocity, and the power which it exerts is brought to bear upon the wheels of the car through the medium of invert wheels in box gearing. Suitable arrangements are made for the return of the current of electricity, so as to complete the circuit. The electricity for working the experimental car is generated at works some distance away, and conveyed along ordinary cables to the tramway, but in ordinary working generating stations would be erected at convenient points in connection with the tramway route, one such station serving a distance of 3 miles. To move one car would require about 2½-horse power, and it is estimated that the cost per car would be about 2d. per mile. The arrangement which has been very highly commended by eminent authorities in the electrical world would seem to open the way for a practicable application of electricity for tramway traffic.

UNITED STATES RAILWAY PROGRESS

The serious commercial misfortunes which American railways have suffered during the past year, the new annual edition—the 17th—of Poor's Manual, just issued—Manual of the Railroads of the United States for 1884, showing their route and mileage, stocks, bonds, debts, cost, traffic, earnings, expenses, and dividends; their organisations, directors, officers, &c. By HENRY V. POOR. London: Effingham Wilson, Royal Exchange—will be read and studied with more than usual interest. The statements given show a mileage at the close of the calendar year 1883 of 121,592 miles, 6753 having been constructed within the year. The total length of completed road at the close of the companies fiscal years was 120,552 miles. The average mileage operated during the year was 110,414. The amount of share capital issued by the several companies up to the close of their respective fiscal years was $3,708,060,583, an increase from the previous year of $207,024,759. The funded debts of the several companies amounted to $3,455,040,383, an increase from the previous year of $219,497,060. Their floating or unfunded debts amounted to $332,370,345, an increase of $61,199,383 from the previous year. The total increase of share capital and of funded and floating debts from the previous year equalled $477,721,202. The total amount of all liabilities at the close of 1883 was $7,495,471,311. The total per mile for completed mileage was $62,176. The total of stock and liabilities for 1882 was $7,016,750,109; per mile, $61,303. The total for 1881 was $6,278,565,052; the amount per mile, $60,645. The total for 1880 was $5,402,038,257; per mile, $58,624. The total for 1879 was $4,872,017,517; per mile, $57,730.

Although since 1879 the actual cost of construction per mile has steadily diminished, very few expensive lines having been built, and during the last half of that period the cost of all construction material being unusually low, the apparent cost as represented by share capital and debt has steadily increased. The increase of cost in the four years since 1879 as represented by share capital and debt equals $4446 per mile, and for the whole number of miles, 120,552, constructed a total of $535,974,192. The gross earnings of all the roads for their several fiscal years of 1883 were $823,772,924, an increase from the previous year of $53,563,025. Of the gross receipts, $215,287,824 were received from passengers, $549,756,695 from freight, and $58,728,405 from miscellaneous sources. The net earnings for the year were $336,911,884, an increase of $21,461,082 from the previous year. The amount of interest paid was $173,139,064, an increase of $18,843,684 from the previous year. The amount of dividends paid was $102,052,548, an increase of $21,114 from the previous year. The percentage in 1883 of gross earnings to investment was 10·99 per cent.; in 1882, 11·74; in 1881, 11·18; in 1880, 11·36; in 1879, 10·80. The percentage of net earnings to investment in 1883 was 4·49 per cent.; in 1882, 4·81; in 1881, 4·56; 1880, 5·04; and in 1879, 4·40 per cent. The earnings per mile of all the railroads operated for 1883 were, gross, $7461; net, $3051; in 1882, gross, $7377; net, $3005; in 1881, gross, $7548; net, $3078; in 1880, gross, $7475; net, 83318; in 1879, gross, $6652; net, $2661.

Since 1880, a period of three years, there have been opened in the United States 28,405 miles of railroad, and that 6091 miles were opened the past year up to the close of the fiscal years of the several companies. The increase of share capital and indebtedness of all the companies for the three years ending Dec. 31, was $2,093,433,054, the cost of the new mileage, as represented by share capital and debt, being about $70,000 per mile. The increase in the three years of the funded debts of all the companies was $924,165,440; of their floating debts, $169,880,406; of the two, $1,094,045,846. It is not probable that the cost of the mileage constructed in the three years equalled the increase of funded and floating debts by at least the sum of $200,000,000. The cost of the mileage constructed certainly did not exceed $30,000 to the mile. The whole increase of the share capital, $999,387,208, and a portion of the funded debt, was in excess of cost of construction. It will be seen by a statement hitherto annexed that stocks and bonds to the amount of $530,132,000 were listed at the New York Stock Exchange in 1883. The amount of stocks and bonds listed was equivalent to about $80,000 per mile of new road built during the year. A considerable amount, however, of the securities listed was on account of old works.

It is in this immense increase of fictitious capital that is to be found the cause of the general distrust which prevails, and the enormous decline in the price of railroad securities. From 1879 to near the close of 1883 a most singular delusion rested upon the public as to their value, and this delusion was taken advantage of on a vast scale by able and unscrupulous adventurers. Whatever was manufactured and put afloat was seized with avidity by an eager and uninformed public. The delusion was increased and prolonged by payments on a very large scale of interest and dividends from capital. In this delusion the most loud-mouthed and unscrupulous promoters usually had the greatest success. The delusion culminated about the time of the opening of the Northern Pacific, in connection with which visionary schemes of immense magnitude had been put upon the market. Their worthlessness, and the rapid decline of their securities, exerted a powerful influence over the public mind, which continues unchecked to the time of writing this. The distrust extends alike to good and bad, so that prices at the present time have as little reference to values as they had at the beginning of 1883. The distrust will probably continue until time shall show what securities are really well based. One cause of the great decline in the shares of lines which were dividend paying, is the competition resulting from the construction of rival lines. The result of this competition is particularly shown in the two great Pacific roads, the Union and Central, both of which for many years have regularly paid dividends, but both of which have now been compelled to forego them. A few years ago there was, in public estimation, no more inviting field for railroad enterprises than the State of Colorado. A vast system of railroads, covering the whole State, was constructed with very great rapidity, involving a nominal expenditure of nearly $100,000,000, almost the whole of which is unproductive.

Such a waste of capital is greatly to be regretted. The remedy, if there be any, lies wholly with investors. In nearly all the States and Territories the construction of railroads may be carried on under general laws, and without application to their respective legislatures. In prosperous times the success that old lines have achieved is predicated of every new one, and the public are attracted into the new by having issued to them often $3 in securities in various forms for one of cash paid in. It not infrequently happens that the venture, in the outset so promising, involves the loss of all the money actually paid into it. In the greater number of cases the disasters that have overtaken numerous enterprises, or schemes, could have been easily foreseen, and were foreseen by persons familiar with the manner in which such enterprises or schemes were gotten up and put upon the market, and familiar with the sources, tendency and extent of the freight and passenger traffic of the districts or sections which such schemes were professedly to accommodate the provision already made therefor.

It i safe to assume that the new mileage constructed in the past three years cost about $30,000 to the mile, and that when our people build, say, 10,000 miles of line in one year, they expend upon them $300,000,000. In addition, a very large amount of fresh capital is yearly expended on old lines, so that we have for many years past been expending upon railroads considerable over $1,000,000 for every working day in the year. Should a large portion of the cost of new lines be lost, the country is undoubtedly the richer by a corresponding amount, from the incidental advantages they confer—the opening up of vast tracts for settlement, and in bringing within the reach of markets products which before had no commercial value.

If it be assumed that the cost in money of all the roads in operation in the United States in 1885 did not exceed, as it certainly did not, the amount of their funded and floating debts, $3,787,410,728, the actual investment was a most profitable one. The net earnings for the year were $336,911,884, a sum equalling about 9 per cent. on their cost. If the fictitious capital could be eliminated from their accounts, their success, as investments, would have no parallel. If to net income be added the advantages that flow from them, the result would be a matter of especial wonder. American railroads during the past year transported over $400,000,000 tons of freight. At $25 the ton the value of this freight would equal $10,000,000,000. It is enough to say that, compared with the wealth of the country 30 years ago, they have created on the American continent a new nation, and created the conditions of a firm and compact nationality.

The volume is, as usual, illustrated with a large series of chromo-lithographed maps of the States and districts referred to, and there is an index which greatly facilitates reference. In saying, however, that the book is in every respect equal to its predecessors, we probably say as much in its praise as can be offered.

STAMPS AND PULVERISERS—THEIR RELATIVE MERITS.

In last week's *Mining Journal* attention was called to a paper, read before the Falmouth Polytechnic Exhibition, by Mr. RICKARD, "On the Globe Mill, or Thompson Pulveriser," an abstract of which is now subjoined. The author says:—The Cornish rolls and stamps for their particular work stand out unrivalled. Efforts of inventors to improve upon them have for the most part proved barren of practical results. The Blake crusher is perhaps an exception, but the value of it consists in its being an adjunct to and not a substitute for the Cornish crusher or the stamps. The Cornish stamps are now, however, destined to make way for a more scientific appliance—the Globe mill or Thompson pulveriser. In describing this instrument the author said it must be remembered that it is a pulveriser and not a crusher like the Blake and Cornish rolls. The Globe mill is simple of construction, cheap, easy of portability, and low in consumption of power. The ore must be broken into fragments about the size of walnuts before treatment in the machine. The mill is fed by a hopper with jigging action, and consists of shoe-ring disc, flexible clutches, ball, screen, with water supply to bearings, &c. The ball is in constant contact with the discs, and by their motion kept revolving on an everchanging axis, giving to it a double motion—one of rotation and another of translation, which are the distinctive features of the mill, and combine the pounding action of the stamps and the grinding action of the roller. When once started the ball tends to fly away from the centre of revolution, and so presses against the steel shoe-ring, grinding the material as it flies round. At each revolution of the ball the pulverised material is washed against the screen fitted at each side of the mill, and that which is sufficiently fine passes through, to be carried away for any further treatment necessary. There is a quick and regular though intermittent delivery of pulverised material through the screen. Another great advantage obtained by this appliance is economy of power. In the stamp head if the surface is uneven, so that one or two harder parts project above the general level, all the work is expended on them, the same force is used whether the whole work is done or only part, thus much power is wasted. In the case of the Globe mill none of the power exerted by the ball is lost, that which is not spent in actual crushing being carried forward.

The quantity of water used for each ton of material with the old stamp is approximately 1600 gallons, whereas that required for the Globe mill does not exceed one-half of this quantity. In this matter of screens the area with which the stamps fitted with the ordinary one side arrangement is very limited in the case of the Globe mill is ample for all requirements. It is 300 (number of revolutions) × 4 ft. (area of screen), whereas in the 20-head stamps it would be about 18 ft. (area of screen) × 30 (falls per minute). The pulveriser is self contained, and no expensive foundations are necessary to fix it, 4 ft. of brick or stone work being sufficient for the largest mill. This is an important point, as the fixing including cost of excavation of the old stamp was a very considerable item. The Thompson pulveriser is made in sections, so as to be easily removed, and when taken to pieces can be put together again without difficulty. The parts are also of such a weight as to be suitable burdens for the weakest mules. The wearing parts are few in number, easily replaceable, and inexpensive. They are the discs, the shoe-ring, and the ball, the two latter being made of steel, and the former of the best chilled charcoal iron. The economical treatment of low-grade tinstone is ever the pursuit of the miner, and while the Globe mill is primarily intended for gold quartz, it can also be used for tinstone which requires reduction to powder for successful treatment. The Globe mill may be used as a dry mill, and as such is attracting the attention of engineers for the pulverising of silver ores for chlorination. It is equally useful for pulverising coal, culm, anthracite, &c., for briquettes and coke, also for silicates and metallic oxides for paint, coprolites, phosphates, bones, &c., for artificial manures, &c. A Globe mill at Messrs. Appleby's Works, Greenwich, the diameter of which was 30 in., and running at the rate of 300 revolutions per minute, and with an indicated horse-power of 6 2-3rds, pulverised 16½ cwts. per hour, 20 tons per 24 hours.

MODERN BRONZE ALLOYS.—An interesting paper on modern bronze alloys for engineering purposes was read before the Society of Engineers, on Monday, by Mr. P. F. NURSEY, V-P. of the society. Considering the extent to which the new bronzes were now used—superseding, as they did, for certain purposes, iron and steel—and following the analogy of the distinction made between the old and the new stone age, Mr. Nursey suggested that we might now be said to have entered the newer bronze age. He then briefly referred to the bronzes of the ancients, observing that modern analysis of many of the bronze coins made in different countries, and at periods extending over several centuries B.C., brought to light a remarkable similarity in the proportions of the ingredients. Having referred to the composition of French bronzes, he described the varieties of phosphor bronze (which was invented by Dr. Künzel, of Blazewitz, Dresden, in 1873,) and their applications; and next silicum bronze, which was invented by M. Weiller, of Angoulême, in 1882, and which is especially applicable and is largely used in the manufacture of telegraph wire, on account of its high conductivity. These, together with manganese bronze, which was invented by Mr. P. M. Parsons in 1876, and delta metal, in which iron and copper were successfully and chemically combined by Mr. A. Dick in 1883, were the modern bronzes of what might be called the primary series. They were largely used for all kinds of engineering purposes, from the making of a spanner to a screw propeller, and from a boiler tube to a piece of artillery. He then entered upon the consideration of those modern bronzes, which, he observed, formed a secondary series, in the sense that several of them were more or less but modifications, combinations, or adaptations of those of the primary series. This secondary series included Otto's phosphor copper, Cockshott's phosphor manganese bronze, Kühne's phosphor lead bronze, Billington's phosphor tin for bronze making, Webster's aluminium bronze, and Wiggin's silveroid and cobalt bronze. Tables of comparative tests to which pieces of these new bronze alloys had been subjected were shown, and specimens of the metals were exhibited.

IMPROVED CHAIN-PUMP.—Mining engineers, contractors, and others engaged in works where it is necessary to raise thick or muddy water, gravel, alluvial deposits, or other like matter which would choke any ordinary pump, will be glad to know of a new and improved chain-pump, which may be worked by hand, horse, bullock, steam, wind, or water power. Mr. C. E. HALL, of the Standard Ironworks, Sheffield, is the patentee, and has made them in various sizes to raise water to any height up to 80 ft., and in any quantity up to 400,000 gallons per hour. Mr. Hall is also the patentee of the Hall dredger, excavator, and loader, suitable for making trenches, ditches, clearing canals, rivers, lowering coal into ships' holds without breakage, &c. He has also patented two ore crushers—the Multiple Action and the Standard—for reducing gold quartz, silver, copper, lead, iron, and other ores, and crushing rolls and pulveriser, fitted with two and three rolls, for reducing all kinds of hard material after passing through the stone-breakers. The eclipse driving chain is another useful invention of Mr. Hall's, the special advantages of which are that each link is composed of a special mixture, to secure the hardness and toughness of steel without its defects; the links are coupled by a packing piece and bolt or rivet, so avoiding the chances of stretching; the wheels are of the simplest kind, and the links take a full bearing upon their periphery the same as belting, thus increasing the bite, in addition to the positive hold secured by the teeth. The price compares favourably with leather belting!

THE ADELAIDE ROCK-DRILL.

The boring of blast holes in mines, quarries, and other works where large quantities of hard rock have to be displaced forms a tedious and expensive portion of the operations, and how to accomplish it in the most economical and rapid manner is a consideration of great importance to engineers and contractors. Hence it is that during the past 10 years inventive skill and practical application have produced and perfected numerous rock-drilling machines which have to a great extent superseded the slow and ancient process with hammer and drill, or jumper. The attention of the readers of the *Mining Journal* has from time to time been called to those machine drills which have closely competed with each other in giving the best results, and the particular one now brought under notice appears so important a step in advance of all that has preceded it in this class of machine that some particulars of its practical application to that branch of industry which the Journal gives special attention to will be acceptable, as also will some reasons why those results prove with unusual force the advantages of utilising compressed air rock-drills in operating on hard rocks. Perhaps the weakest point in those machines which have been taking the lead in this country is their liability to become deranged owing to the somewhat complicated and delicate nature of the details upon which the constant jar of rapid concussion is a very severe strain.

FIG. 1.

This objection, indeed, is sufficiently serious to prevent their economical employment in many districts, at any rate to interfere materially with a more general application of machine drilling in underground and surface works. It is more particularly with a view to overcome this want of durability that the inventor of the Adelaide Drill has given his attention to the subject, and with such results that it is only fair to say that his machine has in this and other particulars distinct advantages of considerable importance.

FIG. 2.

The machine is composed of only one moving part having no tappets or valves of any sort for reciprocating the piston, in fact there are actually no details which the incessant jarring of the rapid percussive action can wear out or break, thus simplicity and durability are its essential qualities, and consequently lightness and portability are obtained without loss of strength. The simplicity and solidity of the working parts also admit of far more rapid reciprocation, and the number of blows per minute being far in excess of other drills it naturally follows that the rate of drilling is—as will be seen from the facts stated below—a great improvement on former machines.

Another feature of novelty in this drill is that the principle of expansion is utilised to the fullest extent as in the case of the modern and economical steam-engine; by this means it is sought to obtain the maximum amount of work with a minimum consumption of power, and the practical results show increased economy in the quantity of air used. Owing to the fact that some of the foreign patents are not yet completed a technical description of the drill in question cannot yet be given, but the manufacturers, Messrs. T. B. JORDAN, SON, and COMMANS, of Gracechurch-street, offer to send their machines on trial to any mine in this country in competition with any machine in the market, and this mode of securing reputation, especially for a rock-drill, should inspire confidence.

As to the results obained in the practical application of the drill it is mentioned that the Snailbeach Mine Company, Pontesbury, has been using two of these machines since September, 1882; in their mine six men, two in a shift, by hand used to drive about 3 ft. in a week in their hard cross-cuts, at an average cost of 16*l.* 10s. per fm., with the machine they do 15 ft. 6 in. per week, at a cost of 8*l.* to 8*l.* 10s. per fathom, the size of driving and conditions being the same in each case. The North Wales Iron Ore Company has thoroughly tested the capacity of this and many other drills in what is termed their "steel ore," which is extremely hard; the opinion of the authorities and the men is said to be entirely in favour of the Adelaide Drill, the other machines tested by them being unable to deal satisfactorily with their hard ground. The Minera Company, Wrexham, have used the machines for two years, and give the average rate of drilling in their hard limestone as 10 to 12 in. per minute, or more than double the rate of any other drill they have tried, but what is still more important the machines have been underground for nine and ten months together in constant work without once getting out of order or requiring repair.

Other mines have furnished equally favourable data as to results of operating with this drill, and inasmuch as this is a question of great importance there is little doubt that these facts will be of considerable interest to the readers of the *Mining Journal*. The above engravings illustrate two forms of the Adelaide Drill (Figs. 1 and 2) The former mounted for underground driving, and the latter for open works.

THE COMET CRUSHER.—The suit of David R. Fraser, Thomas Chalmers, and H. H. Scoville, Jun., *v.* The Gates and Scoville Iron Works, which has been pending for some time in the Circuit Court of the United States for the Northern District of Illinois, has lately been decided in favour of the complainants (Fraser, Chalmers, and Scoville). This suit was brought for the infringement of letters patent of the United States granted to J. W. Rutter, being Re-issue No. 3633, dated Sept. 7, 1869. The Court, Judge Blodgett, sitting, held the Rutter patent to be valid, and found that the said defendant, the Gates and Scoville Ironworks (now the Gates Ironworks) had infringed the first claim thereof. This decision was obtained after a full hearing. The crushers known as the Comet contain the invention secured by the said Rutter patent, which covers an important feature. The crushers manufactured and sold by the Gates and Scoville Ironworks, advertised as "The Greatest Crusher on Earth," contain the same valuable feature, and, as decided by the Court, are an infringement of the said Rutter patent, which Messrs. Fraser and Chalmers control. Messrs. Fraser and Chalmers, the manufacturers of the Comet crusher, have issued a circular calling the attention of parties using "The Greatest Crusher on Earth" to the fact that they are liable, as well as the manufacturers for using machines infringing upon patents controlled by them.

MINING LAWS OF NEW MEXICO.—The following is the Territorial law in relation to mining claims in New Mexico:—"Be it enacted by the Legislative Assembly of the Territory of New Mexico: Sec. 1.—That on and after the first day of April, 1884, in addition to the present requirements of law in regard to the location of mining claims shall within ninety days from the date of taking possession of the same, and previous to placing the same upon record in the county clerk's office, shall sink a discovery shaft upon such claim to the depth of at least 10 ft. from the lower part or rim of such shaft at the surface, or shall drive a tunnel, open-cut, or adit upon such claim exposing mineral in face at least 10 ft. below the surface. Sec. 2.—All laws or parts of laws in conflict with this Act are hereby repealed."

IMPROVEMENTS IN PUMPING MACHINERY.

FIG. 1.

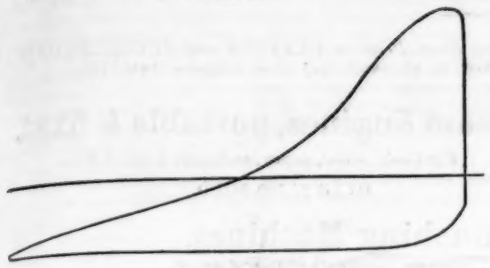


FIG. 5.

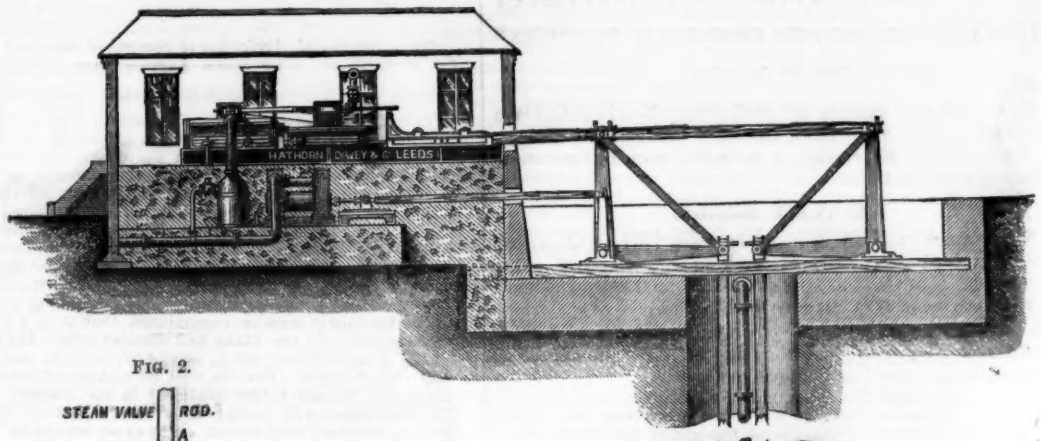


FIG. 2.

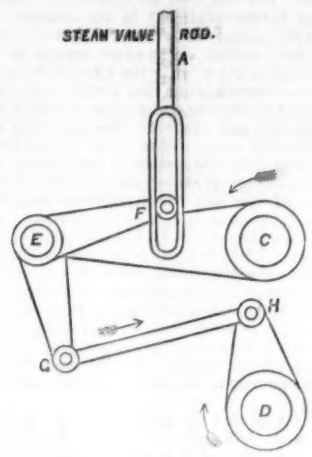
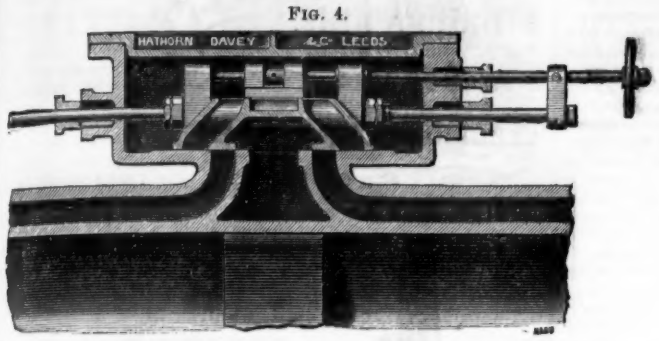


FIG. 4.



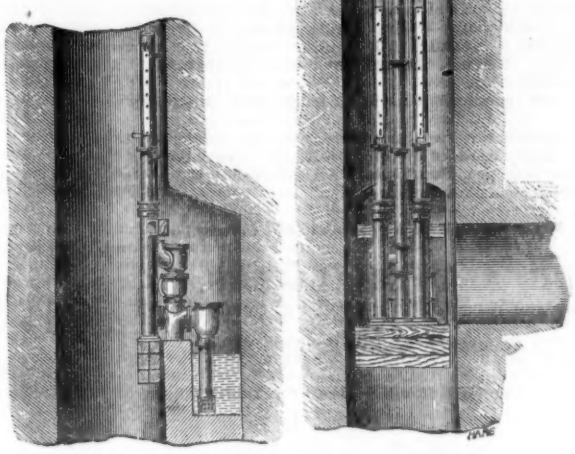
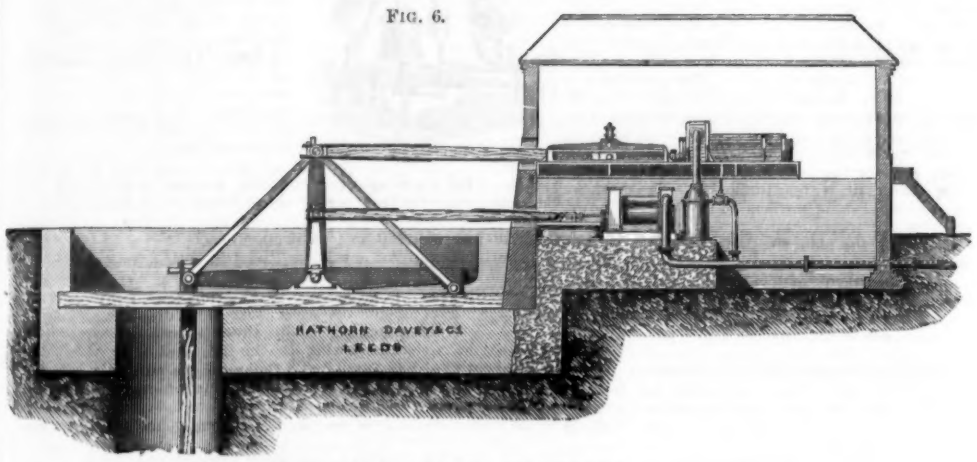


FIG. 3.

FIG. 6.



IMPROVEMENTS IN PUMPING MACHINERY.

We have from time to time noticed the progress made in connection with pumping machinery, and now have an opportunity of publishing some recent improvements which have been made by Mr. HENRY DAVEY, of the firm of Messrs. HATHORN, DAVEY, and Co., of Leeds. The Compound Differential Pumping Engine is well known in mining circles, and as it has been with all inventions which have received a wide application, improvements have from time to time suggested themselves. One of the applications of the differential gear is to existing Cornish engines, and over 200 of such applications have been made by the makers. We have recently seen one of the latest examples in a 90-in. Cornish engine at the East London Waterworks. The steam diagram produced by this gear is shown in Fig. 1, which is a proof of the very early cut-off and consequent economy which the gear is capable of effecting; and when one observes the ease and noiseless action of the gear, and the fewness and simplicity of its parts, compared with the Cornish gear, one wonders why it is not always adopted. We are told that in Westphalia there are very few direct-acting engines to which this gear has not been applied. The gear itself is well known; but our object is to describe some improvements lately effected.

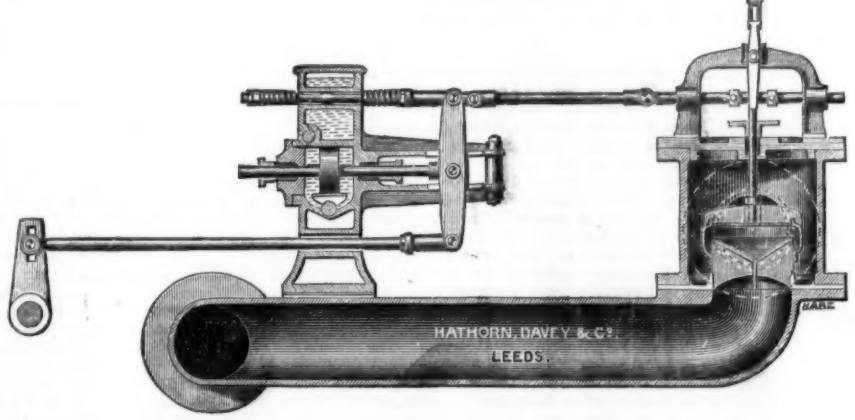
One of the improvements is that of giving a motion to the steam valve differing from that of the other valves, so that the early cutoff of steam occurs without in any way disturbing the differential motion of the other valves. The steam valve motion is adjustable, and may be varied to effect any degree of cut-off. We may best describe its motion by reference to Fig. 2. *C* is the rocking shaft, worked by the differential gear, and which gives motion to all the valves; but its connection to the steam valve is not made directly by a simple lever, as in the case of the other valves, but is connected indirectly by means of the lever (*f*), pivoted on the end of the lever (*e*); *a* is the steam valve rod; *d* is the second rocking shaft, which receives a motion from the engine itself, and which is connected to the lever (*f*) by the connecting rod (*g*, *h*). The action of the gear may be thus described:—When the engine is at rest and about to commence its indoor stroke the rocking shaft (*c*) is moved by the action of the differential gear, and its movement through the lever (*f*) pulls down the valve rod (*a*), opening the steam valve. The engine then commences its stroke, and in so doing gives a motion to the rocking shaft (*d*), opposite to that of the shaft (*c*). The effect of this motion is to pull the connecting rod (*g*,*h*) in the direction of the arrow, and thereby close the valve. It will be seen at once that this arrangement enables the steam valve to be closed immediately the engine commences its stroke without disturbing in any way the differential motion given to the other valves. In other words, the rocking shaft (*c*) is employed to open all the valves and to close all the valves except the steam valve, the steam valve being closed by the motion of the rocking shaft (*d*) at any point in the stroke determined by the adjustment of the gear.

This motion has not only been applied to Cornish engines; but it is also applied by Mr. Davey to many of his large Compound Differential Engines. Among others, three engines at the Staffordshire Potteries Waterworks, two at the Birmingham Waterworks, and the large engines which are now being erected for the South Staffordshire Mines Drainage Commissioners. In addition to the motion above described there has been introduced into the differential gear a trip motion, which causes all the valves to be suddenly closed in the event of the engine exceeding through loss of load its normal rate of motion. The trip gear has been applied to the engines above named, and is being applied by Messrs. Hathorn, Davey, and Co. to a large Cornish engine which they are building for the Wolverhampton Waterworks. The trip gear itself will be easily understood from the following description:—In addition to the main and pausing cataracts of the gear itself, there is a small cataract attached to a catch in the rod which forms the connection between the gear and the rocking shaft, which actuates the valves. When the engine is at work under its normal conditions the cataract is adjusted so that the catch is kept in its place; but immediately the engine motion exceeds its normal limits the catch is displaced, and the connection between the gear and the valves severed. The valves, being thus released, all fall to their seats, and the engine is prevented from doing any damage.

This arrangement is now combined with the main gear so as to be self-contained, so that in applying it to an engine the gear complete in every respect and self-contained is put to stand on the floor of the engine room, and all that is then necessary is that the valve rods should be coupled up to it. The whole of the valve gear is then self-contained in a little apparatus on the engine room floor, and the complication of cataracts and levers of the Cornish gear which are usually put in a pit under the floor are entirely done away with. One great practical advantage from this arrangement is that with it the Cornish engine can be worked by an untrained man. The arrangement we have just described is also applied to compound engines according to the arrangement illustrated in *Fig.* 3. The trip gear is there employed to close the passage between the high and low pressure cylinders in the case of the engine running away.

Another improvement worthy of notice is that of providing a means by which an engine may be worked out of balance, and is especially useful when the engine is used for sinking operations. This apparatus is illustrated in Fig. 4, and consists of a movable shutter placed on the back of the low-pressure valve. The shutter is under the control of the engineman, who is enabled by means of it to vary the supply of steam between the two ends of the cylinder, so that the engine is caused to work uniformly, notwithstanding that the pumps will be out of balance. The arrangement will be readily understood by a reference to the engraving. Fig. 5 shows the usual type of engine to which these two last-named improvements are applied.

Fig. 6 is an engraving of a horizontal Cornish engine recently made by Messrs. Hathorn, Davey, and Co., and it is a very suitable engine for applying to a single line of rods in metalliferous mines. The engine, as will be seen from the engraving, is very simple, light, and easily transported. The distribution of steam in the engine is precisely the same as that of an ordinary vertical Cornish engine, and works with the same amount of economy. It takes steam only on the indoor stroke when the spears are being lifted. During the outdoor stroke the weight of the spears lift the water, so that the action of the engine and the arrangement of the pumps are precisely similar to that of the ordinary Cornish engine. This engine, however, is only about half the weight of a Cornish engine of the same power, whilst the buildings and foundations required are much less expensive.



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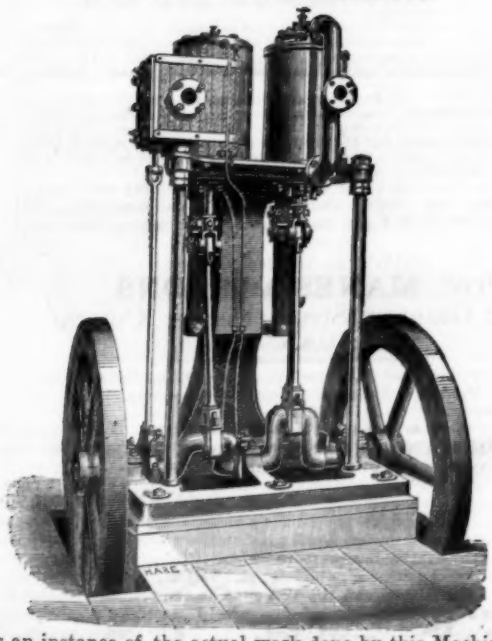

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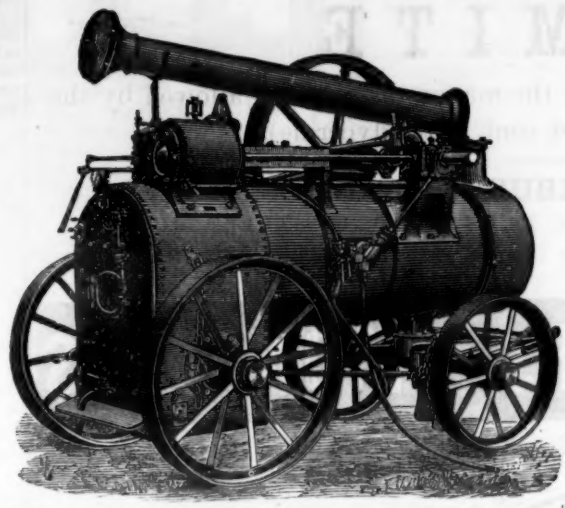

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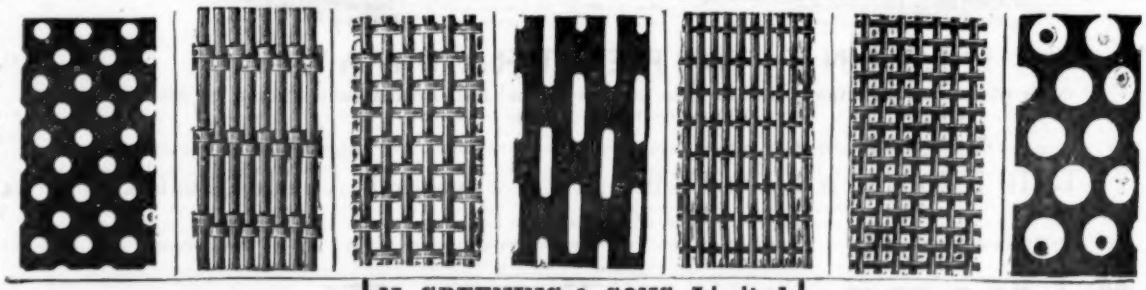

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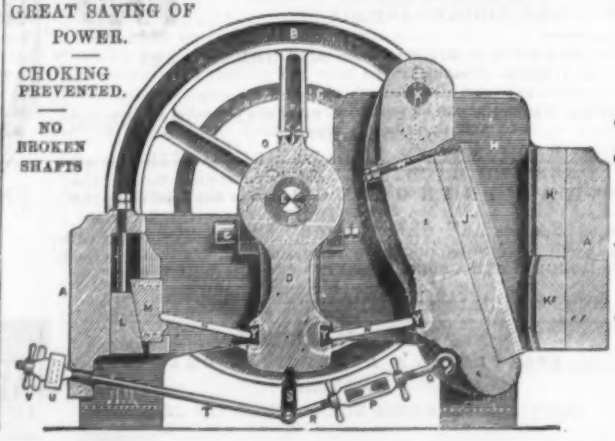

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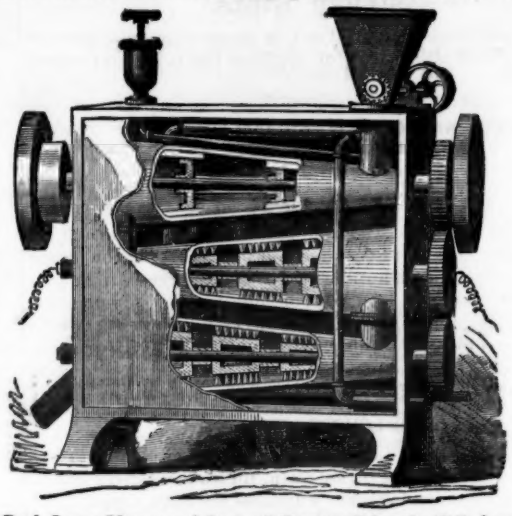
PROFESSOR JAMES MANES AND SONS call the attention of miners, mineowners, capitalists, and others interested in the working of gold or silver mines to their new Electro Metallurgical Machine for extracting fine and rusty gold from sands or tailings of stamp mills, or the sands of hydraulic gold diggings, or from the black sands on the coast of Oregon or California, and other parts of the world where gold is found.

The problem that has long troubled the worker of free-milling gold and silver ores is a method to save the mineral now lost in the tailings of stamp mills or flumes. This alone, if it could be saved, would amount to many million dollars profit each year, besides enabling the working of much territory which is now lying idle for want of an economical and thorough process of treatment.



Prof. James Manes and Sons, of Denver, Colorado, U.S., have invented a machine (represented in the above engraving) which it is claimed will save nearly the entire amount of mineral which passes through it, the loss not being over 10 per cent., and in many cases not in excess of half that amount. The machine is a cheap and practical process—it never need stop for charging or cleaning up, being nearly self-acting. Steam, electricity, and mercury are used in the process of extracting the mineral.

This machine or amalgamator is adapted for free-milling gold or silver ores, or refractory after roasting. It consists of a series of three or more large cylinders, wider at one end than the other, placed one above the other in a horizontal position, a shaft or spindle running through the centre of each.

The ore and mercury are fed into the first cylinder, passing into the second, and then to the third. The first cylinder is furnished with steel mullers which nearly touch the sides of the cylinder, and revolve at a good rate of speed, mixing the mercury and ore. The second cylinder is furnished with large steel brushes attached to the shaft or spindle, revolving at a high rate of speed; through this a current of electricity is furnished by a Westinghouse dynamic electro machine, which materially assists in gathering the particles of very fine gold together, and thoroughly amalgamating the metal and mercury. The third cylinder is similarly furnished to the second; into this the amalgam passes, and is again acted upon and mixed by the brushes to catch any gold which might have escaped amalgamation in the second. A fourth cylinder may be used if found necessary.

The amalgamated pulp then passes through a revolving copper drum, plated with quicksilver inside. As the drum revolves it takes up the most part of the amalgamated gold. As the inside of the drum is constantly washed with a spray of water from perforated pipes fixed inside of said drum, a clean-plated surface is constantly brought in contact with the pulp or tailings as it passes out from the cylinders. After leaving the drum it falls down on to incline copper plates, the same as is now used in stamp mills.

The amalgam can be collected from the drum and plates without stopping the machine, and any live quicksilver that passes will be caught in syphons. The tailings are carried off with the water. The machine when attached to the flume will be driven by the waste water; it sifts the fine sands from the coarse gravel, and amalgamates it as above.

The specific points claimed by Prof. Manes and Sons in their patent are—

1.—The saving of almost all the mineral passing through the machine.

2.—The loss being less than 10 per cent.

3.—The entire absence of loss of the amalgamated material, thereby saving all the mercury, which, with the processes now in use, there is a large loss both of mercury and the precious metal.

4.—The small cost per ton at which the ore can be treated.

By the addition of the powerful current of electricity that passes off the revolving brushes, the most minute particles of gold will be caught and retained, which in the ordinary flume and stamps passes off with the water; this often amounts to a large percentage.

The inventors state that if English stock companies will give their assistance to work the black sands of Oregon and California by paying for the building of the machines, they will take a share of the gold for their services, or they will send their machines to any part of the world, or will sell patent rights to those desiring any of their patent machines or revolving furnaces for roasting or smelting ores, ball pulverisers, &c.

Prof. James Manes and Sons are agents for the Morey and Sparey Ball Pulveriser, that crushes and pulverises at the same time, and does as much work as eight stamps in a day, crushing either wet or dry.

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